Control and Coordination Exemplar Solutions

Multiple Choice Questions

1. Which of the following statements is correct about receptors?
(a) Gustatory receptors detect taste while olfactory receptors detect smell
(b) Both gustatory and olfactory receptors detect smell
(c) Auditory receptors detect smell and olfactory receptors detect taste
(d) Olfactory receptors detect taste and gustatory receptors smell
Soln: The answer is (a) Gustatory receptors detect taste while olfactory receptors detect smell
Explanation: A receptor is a cell that is sensitive to external stimuli such as light, taste, and smell. Ex: Photoreceptors detect light. Gustatory receptors detect taste. Olfactory receptors detect smell.

2. Electrical impulse travels in a neuron from
(a) Dendrite → axon → axonal end → cell body
(b) Cell body → dendrite → axon → axonal end
(c) Dendrite → cell body → axon → axonal end
(d) Axonal end → axon → cell body → dendrite
Soln: Answer is (c) Dendrite → cell body → axon → axonal end
Explanation: Stimulus is received by dendrites which are transmitted to cyton through axon. Stimulus reaches the terminal branches called axonal end from where they are transmitted to another neuron.

3. In a synapse, a chemical signal is transmitted from
(a) dendritic end of one neuron to the axonal end of another neuron
(b) axon to the cell body of the same neuron
(c) cell body to the axonal end of the same neuron
(d) axonal end of one neuron to the dendritic end of another neuron
Soln: Answer is (d) axonal end of one neuron to dendritic end of another neuron
Explanation: Electric impulses travel from the axon to the dendrite of another neuron through a synaptic gap which consists of SYNAPSE.

4. In a neuron, the conversion of the electrical signal to a chemical signal occurs/in
(a) cell body
(b) axonal end
(c) dendritic end
(d) axon
Soln: Answer is (b) axonal end
Explanation: At the axonal end electric impulse triggers the release of neurotransmitters. These chemicals enter the dendrite of another neuron to transmit the signal.

5. Which is the correct sequence of the components of a reflex arc?

(a) Receptors→ Muscles→ Sensory neuron→ Motor neuron→ Spinal cord

(b) Receptors→ Motor neuron → Spinal cord → Sensory neuron → Muscle

(c) Receptors → Spinal cord → Sensory neuron → Motor neuron → Muscle

(d) Receptors → Sensory neuron → Spinal cord → Motor neuron → Muscle

Soln: Answer is (d) Receptors → Sensory neuron → Spinal cord → Motor neuron → Muscle

Explanation: Sensory neurons receive signals from receptors. These signals are sent to the spinal cord which reaches Muscles through motor neurons.

6. Which of the following statements are true?

(i) Sudden action in response to something in the environment is called reflex action

(ii) Sensory neurons carry signals from the spinal cord to muscles

(iii) Motor neurons carry signals from receptors to the spinal cord

(iv) The path through which signals are transmitted from a receptor to a muscle or a gland is called reflex arc

(a) (i) and (ii)

(b) (i) and (iii)

(c) (i) and (iv)

(d) (i), (ii), and (iii)

Soln: Answer is (c) (i) and (iv)

Explanation: Sensory neurons carry signals from muscles to the spinal cord hence statements ii) and iv) are wrong statements.

7. Which of the following statements are true about the brain?

(i) The main thinking part of the brain is the hindbrain

(ii) Centres of hearing, smell, memory, sight, etc are located in the forebrain.

(iii) Involuntary actions like salivation, vomiting, and blood pressure are controlled by the medulla in the hindbrain

(iv) Cerebellum does not control posture and balance of the body

(a) (i) and (ii)

(b) (i), (ii), and (iii)

(c) (ii) and (iii)

(d) (iii) and (iv)

Soln: Answer is (c) (ii) and (iii)

Explanation: Forebrain is the thinking part of the brain hence statement i) is wrong. The cerebellum controls posture and balance of the body hence statement iv) is wrong.

8. Posture and balance of the body is controlled by
(a) cerebrum
(b) cerebellum
(c) medulla
(d) pons
Soln: The answer is (b) cerebellum
Explanation: Cerebrum is responsible for sensory processing. The medulla controls involuntary functions. Pons regulates respiration and controls involuntary actions and sensations such as touch and pain.

9. Spinal cord originates from
(a) cerebrum
(b) medulla
(c) pons
(d) cerebellum
Soln: The answer is (b) medulla

10. The movement of a shoot towards light is
(a) geotropism
(b) hydrotropism
(c) chemotropism
(d) phototropism
Soln: The answer is (d) phototropism
Explanation: The growth of plant roots towards or away from moisture is called hydrotropism. Plant growth in response to gravitational force is called geotropism. The growth of plants in response to chemical stimuli is called chemotropism.

11. The main function of abscisic acid in plants is to
(a) increase the length of cells
(b) promote cell division
(c) inhibit growth
(d) promote the growth of stem
Soln: The answer is (c) inhibit growth
Explanation: Auxins increase the length of cells. Cytokinins promote cell division. Gibberellins promote the growth of the stem.

12. Which of the following is not associated with the growth of plants?
(a) Auxin
(b) Gibberellins
(c) Cytokinins
(d) Abscisic acid
Soln: Answer is (d) Abscisic acid
Explanation: Abscisic acid inhibits the growth of plants hence it is not associated with growth.

13. Iodine is necessary for the synthesis of which hormone?
(a) Adrenaline
(b) Thyroxin
(c) Auxin
(d) Insulin
Soln: The answer is (b) Thyroxin

14. Choose the incorrect statement about insulin
(a) It is produced by the pancreas
(b) It regulates the growth and development of the body
(c) It regulates blood sugar level
(d) Insufficient secretion of insulin will cause diabetes
Soln: Answer is (b) It regulates the growth and development of the body

15. Select the mismatched pair
(a) Adrenaline: Pituitary gland
(b) Testosterone: Testes
(c) Estrogen: Ovary
(d) Thyroxin: Thyroid gland
Soln: Answer is (a) Adrenaline: Pituitary gland
Explanation: Adrenaline is secreted by the Adrenal gland and the Pituitary gland produces TSH, FSH, and GSH hormones.

16. The shape of guard cells changes due to changes in the
(a) protein composition of cells
(b) temperature of cells
(c) amount of water in cells
(d) position of the nucleus in the cells
Soln: The answer is (c) the amount of water in cells
Explanation: Excess of water will turn guard cells turgid and loss of water will turn guard cells flaccid.

17. The growth of tendrils in pea plants is due to
(a) effect of light
(b) effect of gravity
(c) rapid cell divisions in tendrillar cells that are away from the support
(d) rapid cell divisions in tendrillar cells in contact with the support
Soln: The answer is (c) rapid cell divisions in tendrillar cells that are away from the support

18. The growth of pollen tubes towards ovules is due to
(a) hydrotropism
(b) chemotropism
(c) geotropism
(d) phototropism
Soln: The answer is (b) chemotropism
Explanation: Chemicals released by ovules stimulate the growth of pollen tubes towards ovules.

19. The movement of the sunflower in accordance with the path of the sun is due to
(a) phototropism
(b) geotropism
(c) chemotropism
(d) hydrotropism
Soln: The answer is (a) phototropism
Explanation: The movement of shoots towards light is called phototropism.
Plant growth in response to gravitational force is called geotropism. The growth of plants in response to chemical stimuli is called chemotropism. The growth of plant roots towards or away from moisture is called hydrotropism.

20. The substance that triggers the fall of mature leaves and fruits from plants is due to
(a) auxin
(b) gibberellin
(c) abscisic acid
(d) cytokinin
Soln: Answer is (c) abscisic acid
Explanation: Abscisic acid forms a layer of abscission.
This layer disconnects the living tissue of the leaf from the other parts.

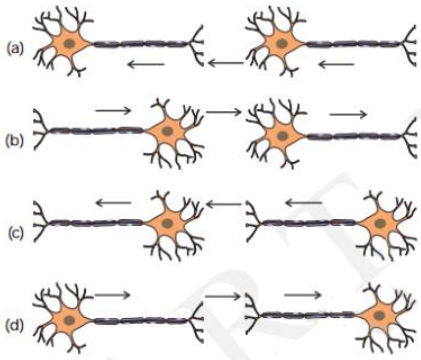
21. Which of the following statements about the transmission of nerve impulses is incorrect?
(a) The nerve impulse travels from the dendritic end toward the axonal end
(b) At the dendritic end electrical impulses bring about the release of some chemicals which generate an electrical impulse at the axonal end of another neuron
(c) The chemicals released from the axonal end of one neuron cross the synapse and generate a similar electrical impulse in a dendrite of another neuron
(d) A neuron transmits electrical impulses not only to another neuron but also to muscle and gland cells
Soln: Answer is (b) At the dendritic end electrical impulses bring about the release of some chemicals which generate an electrical impulse at the axonal end of another neuron
Explanation: Chemicals or neurotransmitters are released at the axonal end, not on the dendritic end. Hence statement b) is incorrect.

22. Involuntary actions in the body are controlled by
(a) medulla in the forebrain
(b) medulla in the midbrain
(c) medulla in the hindbrain
(d) medulla in the spinal cord
Soln: Answer is (c) medulla in hindbrain
Explanation: Medulla is present only in the hindbrain

23. Which of the following is not an involuntary action?
(a) Vomiting
(b) Salivation
(c) Heartbeat
(d) Chewing
Soln: Answer is (d) Chewing

24. When a person is suffering from a severe cold, he or she cannot
(a) differentiate the taste of an apple from that of an ice cream
(b) differentiate the smell of a perfume from that of an agarbatti
(c) differentiate red light from green light
(d) differentiate a hot object from a cold object
Soln: Answer is (b) differentiate the smell of a perfume from that of an agarbatti
Explanation: During cold olfactory receptors get blocked hence we cannot differentiate smell.

25. What is the correct direction of flow of electrical impulses?



Soln: The answer is c)
Explanation: The dendrites of a neuron receive electrical impulses from the axonal end of another neuron. After that, the electrical impulse travels through the cell body, axon; to the axonal end.

26. Which statement is not true about thyroxine?
(a) Iron is essential for the synthesis of thyroxine
(b) It regulates carbohydrates, protein, and fat metabolism in the body
(c) The thyroid gland requires iodine to synthesize thyroxine
(d) Thyroxine is also called thyroid hormone
Soln: The answer is (a) Iron is essential for the synthesis of thyroxine
Explanation: Iodine is essential for the synthesis of thyroxine but not iron hence statement a) is wrong.

27. Dwarfism results due to
(a) Excess secretion of thyroxin
(b) Less secretion of growth hormone
(c) Less secretion of adrenaline
(d) Excess secretion of growth hormone
Soln: The answer is (b) Less secretion of growth hormone
Explanation: Growth hormones are responsible for the overall growth of an organism. When there is no secretion of growth hormones it leads to dwarfism.

28. Dramatic changes in body features associated with puberty are mainly because of the secretion of
(a) estrogen from the testes and testosterone from the ovary
(b) estrogen from the adrenal gland and testosterone from the pituitary gland
(c) testosterone from the testes and estrogen from the ovary
(d) testosterone from the thyroid gland and estrogen from the pituitary gland
Soln: The answer is (c) testosterone from the testes and estrogen from the ovary
Explanation: These are the sex hormones responsible for the secondary character that appears after puberty. Males secrete testosterone and females secrete estrogen.

29. A doctor advised a person to take an injection of insulin because
(a) his blood pressure was low
(b) his heart was beating slowly
(c) he was suffering from goiter
(d) the sugar level in his blood was high
Soln: The answer is (d) the sugar level in his blood was high
Explanation: Patients suffering from diabetes will have high blood glucose due to non-functioning or lack of insulin hormone. Such patients are administered insulin injections to regulate blood glucose.

30. The hormone which increases the fertility in males is called
(a) estrogen
(b) testosterone
(c) insulin
(d) growth hormone
Soln: The answer is (b) testosterone

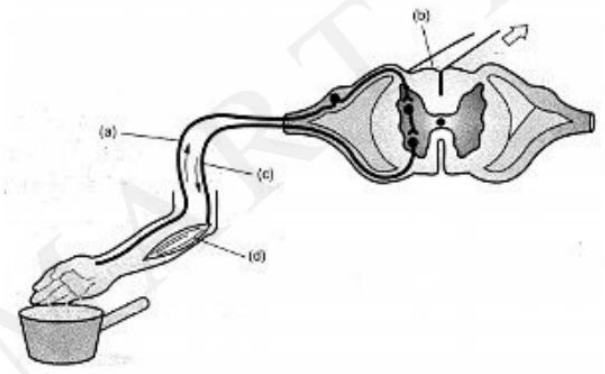
31. Which of the following endocrine glands is unpaired?
(a) Adrenal
(b) Testes
(c) Pituitary
(d) Ovary
Soln: The answer is (c) Pituitary
Explanation: Adrenal glands are two which are present on top of each kidney. The testes are a paired gland in males that produces male sex hormones. The ovary is a paired gland in females that produces female sex hormones. The pituitary gland is an independent gland present below the brain. It is called the master gland as it secretes most of the hormones.

32. The junction between two neurons is called
(a) cell junction
(b) neuromuscular junction
(c) neural joint
(d) synapse
Soln: The answer is (d) synapse
Explanation: A synapse is a structure that allows a neuron to pass an electric signal to the next neuron or effector cell. Hence it is a junction between two neurons.

33. In humans, the life processes are controlled and regulated by
(a) reproductive and endocrine systems
(b) respiratory and nervous systems
(c) endocrine and digestive systems
(d) nervous and endocrine systems
Soln: Answer is (d) nervous and endocrine systems
Explanation: Reproductive, respiratory, and digestive systems have no role to play in the control and regulation of life processes. It is the nervous system and the endocrine system that control and regulate all the processes including Reproductive, respiratory, and digestive systems.

Short Answer Questions

34. Label the parts (a), (b), (c), and (d) and show the direction of flow of electrical signals in Figure 7.2.



Soln:
a) Sensory neuron
b) Spinal cord
c) Motor neuron
d) Muscle

35. Name the plant hormones responsible for the following
(a) elongation of cells
(b) growth of stem
(c) promotion of cell division
(d) falling of senescent leaves.
Soln:
a) Auxin
b) Gibberellin
c) Cytokinin
d) Abscisic acid

36. Label the endocrine glands in Figure 7.3.

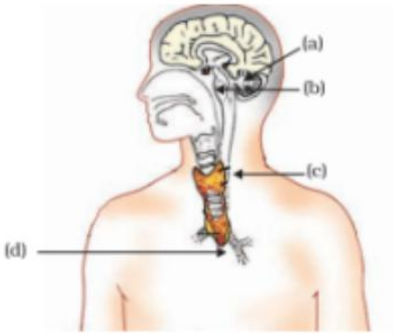


Figure 7.3

Soln:

a) Pineal Gland

b) Pituitary gland

c) Thyroid gland

d) Thymus

37. In Figure 7.4 (a), (b) and (c), which appears more accurate and why?

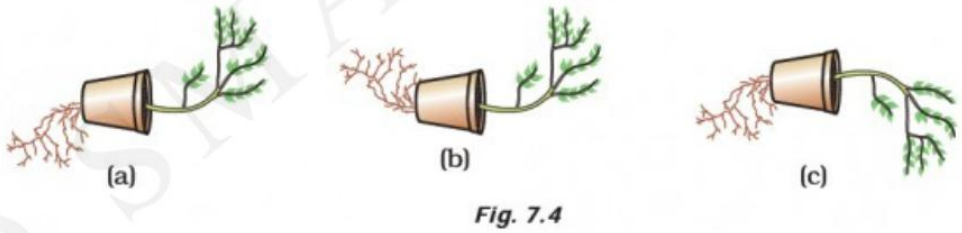
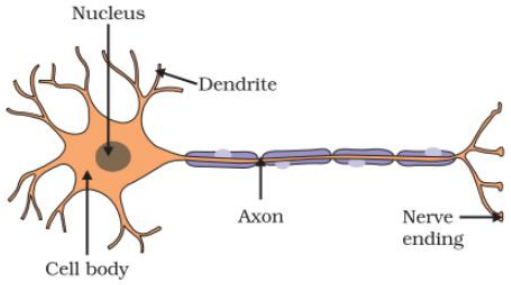


Fig. 7.4

Soln: Figure a) is more accurate because in figure a plant root shows positive geotropism and the shoot shows positive phototropism.

38. Label the parts of a neuron in Figure 7.5.



Soln:

a) Dendrite b) Cellbody c) Axon d) Axon terminal.

39. Match the terms of Column (A) with those of Column (B)

Column A	Column B
(a) Olfactory receptors	(i) Tongue
(b) Thermoreceptors	(ii) Eye
(c) Gustatoreceptors	(iii) Nose
(d) Photoreceptors	(iv) Skin

Soln:

Column A	Column B
(a) Olfactory receptors	(iii) Nose
(b) Thermoreceptors	(iv) Skin
(c) Gustatoreceptors	(i) Tongue
(d) Photoreceptors	(ii) Eye

40. What is a tropic movement? Explain with an example.

Soln: Directional growth movement of a plant due to external stimulus is called tropic movement. Movement can be either toward the stimulus or away from the stimulus. Ex: Roots show positive geotropic movement and they grow with the direction of gravity whereas shoots show negative geotropic movement.

41. What will happen if the intake of iodine in our diet is low?

Soln: Iodine is essential for the synthesis of the hormone thyroxine. If we take a low iodine diet it leads to hypothyroidism which results in a disease called goiter.

42. What happens at the synapse between two neurons?

Soln: At Synapse nerve impulse of a nerve cell gets converted to neurotransmitters which travel towards the dendrites of the next neuron leading to an electric impulse.

43. Answer the following :

(a) Which hormone is responsible for the changes noticed in females at puberty?

(b) Dwarfism results due to deficiency of which hormone?

(c) Blood sugar level rises due to deficiency of which hormone?

(d) Iodine is necessary for the synthesis of which hormone?

Soln:

a) Oestrogen hormone is responsible for the changes noticed in females at puberty

b) Dwarfism results due to deficiency of growth hormones.

c) Blood sugar level rises due to deficiency of insulin hormone

d) Iodine is necessary for the synthesis of thyroxine hormone

44. Answer the following :

(a) Name the endocrine gland associated with the brain.

(b) Which gland secretes digestive enzymes as well as hormones?

(c) Name the endocrine gland associated with the kidneys.

(d) Which endocrine gland is present in males but not in females?

Soln:

a) The pituitary gland is associated with the brain

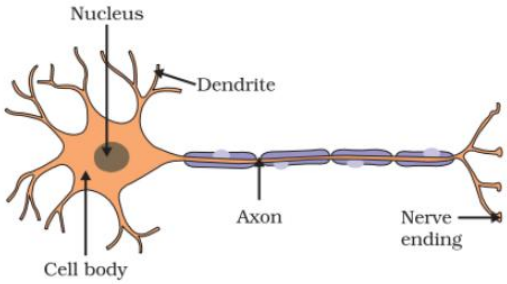
b) Pancreas secretes digestive enzymes as well as hormones

c) The adrenal gland is associated with the kidneys

d) Testis is present in males but not in females

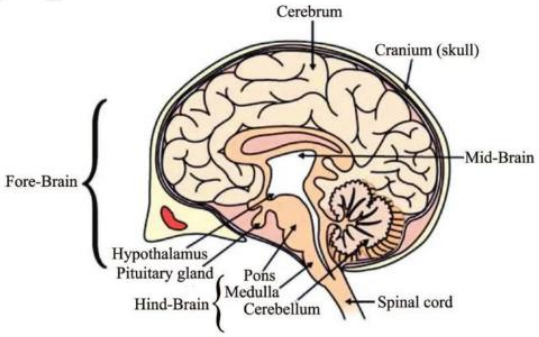
Long Answer Questions

45. Draw the structure of a neuron and explain its function.
Soln: Neuron is a highly specialized cell responsible for the transmission of nerve impulses.



A soma or cell body is a star-shaped hair-like structure hair-like structures are called dendrites. Dendrites receive nerve impulses.
The axon is the tail of the nucleus; it ends in hair-like structures that make nerve endings. Nerve endings relay nerve impulses.
The myelin sheath acts as an insulator around the axon. It insulates axons from the electrical impulses from the surroundings.
The function of neurons is to process and transmit information from the brain to all parts of the body.

46. What are the major parts of the brain? Mention the functions of different parts.
Soln:



Functions of Brain Parts

- Forebrain: The forebrain is the main thinking part of the brain. It has regions that receive sensory impulses from various receptors. Separate areas of the fore-brain are specialized for hearing, smell, sight, and so on.
- Midbrain and Hindbrain: Involuntary actions are controlled by the midbrain and hind-brain.
- Cerebellum: Responsible for voluntary actions and maintaining the posture and balance of the body.
- Cerebrum: Cerebrum is responsible for sensory processing.
- Medulla: Medulla controls involuntary functions.
- Pons: Pons regulates respiration and controls involuntary actions and sensations such as touch and pain.
- Hypothalamus: Hypothalamus controls the sleep and wake cycle.

47. What constitutes the central and peripheral nervous systems? How are the components of the central nervous system protected?

Soln: The central nervous system comprises the brain and spinal cord. The peripheral nervous system is composed of nerves that are outside the spinal cord.

The central nervous system has a well-developed system for its protection. The brain is enclosed in a hard shell known as a skull. The spinal cord is enclosed in a vertebral column for its protection. Along with these, there is cerebrospinal fluid which protects the brain from mechanical shocks.

48. Mention one function for each of these hormones :

(a) Thyroxin (b) Insulin (c) Adrenaline (d) Growth hormone (e) Testosterone.

Soln:

- Thyroxin: Thyroxine regulates carbohydrate, protein, and fat metabolism in the body to provide the best balance for growth.
- Insulin: Insulin regulates blood glucose levels. If insulin is not secreted at an appropriate level it leads to a rise in blood glucose level which results in many adverse effects on life processes.
- Adrenaline: Adrenaline prepares our body for emergencies. Adrenaline is also called a fight and flight hormone.
- Growth Hormone: Growth hormone is responsible for the growth and regulation of growth.
- Testosterone: Testosterone is responsible for the expression of secondary sexual characteristics in the body.

49. Name various plant hormones. Also give their physiological effects on plant growth and development.

Soln:

a) Auxin- responsible for elongation of cells

b) Gibberellin- responsible for the growth of the stem and thereby increases the girth of the stem

c) Cytokinin promotes cell division in plants

d) Abscisic acid stops the growth of the plant and makes leaves and fruits fall from the plant.

50. What are reflex actions? Give two examples. Explain a reflex arc.

Soln: The sudden involuntary movement in a voluntary organ; in response to a stimulus; is called reflex action.

Examples of reflex action:

(a) Moving your hand away from a hot iron plate

(b) Blinking of eyes

Reflex Arc.

The reflex arc is a path of electrical impulse during a reflex action. It is composed of sensory neurons, the spinal cord, motor neurons, and muscle.

Steps of the reflex arc

• The sensory neuron picks signals from the stimulus and carries the signals to the spinal cord.

• The spinal cord processes the signals and sends messages through the motor neuron.

• Motor neurons transmit the signals to the effector muscle so that the muscle can take immediate action.

51. "Nervous and hormonal systems together perform the function of control and coordination in human beings." Justify the statement.

Soln:

Control and coordination in human beings are under the influence of the nervous system. The brain controls all the organelles and organ systems. The control is obtained by a network of neurons that carry signals through neurotransmitters in the form of electric impulses to the brain and from the brain.

The hormonal system consists of a variety of hormones secreted by various glands in our body. The hormonal system coordinates the function of the nervous system. Hormones indirectly control the life processes by a feedback mechanism. They can produce hormones when required and can stop production when not required.

52. How does chemical coordination take place in animals?

Soln:

Chemical coordination takes place in animals through hormones produced by glands present in animals. Hormones are directly released into the bloodstream to reach the target site. Hormones control the behavior of the target tissue.

Example:

The adrenal gland secretes Adrenaline which reaches the heart, lungs, and Gastrointestinal tract. The heart speeds up its pumping action so that more blood can be supplied to the limbs and facial muscles. However, the activity of the GI tract is slowed down to ensure better blood supply in limbs. Thus, adrenaline prepares the body for a fight-or-flight situation.

53. Why is the flow of signals in a synapse from the axonal end of one neuron to the dendritic end of another neuron but not the reverse?

Soln:

Electrical impulse travels through a neuron. But to be transmitted to another neuron, it needs to be passed in the form of neurotransmitters. Neurotransmitters are specialized chemicals. They can enter a neuron only through specialized channels. Such channels are present in dendrites but not in axons. On the other hand, a neurotransmitter can enter a dendrite. Due to this, the flow of signals in a synapse is from the axonal end of one neuron to the dendritic end of another neuron but not the reverse.