Chap 6. Control and Coordination

1. Write a note on neuron

A neuron is the structural and functional unit of the nervous system. It transmits electrical impulses. It is also known as nerve cell.

The cell body contains the nucleus and the cytoplasm. Dendrites are short branched projections that receive signals from other neurons or sense organs. Axon is a long single projection that transmits the impulse away from the cell body to the next neuron or neuromuscular junction.

2. What is Synapse? How is the information transmitted in a neuron?

A synapse is the junction (gap) between two neurons where a nerve impulse is transmitted from one neuron to the next.

When a nerve cell receives information at its dendrite tip, it creates an electrical signal. This signal travels through the cell body and down the axon. At the axon's end, the signal releases chemicals that cross the synapse and trigger the same process in the next nerve cell.

3. What is a reflex action? What is a reflex arc?

A reflex action is a sudden, involuntary, rapid response to a stimulus. It does not involve thinking or the brain. It is coordinated by the spinal cord.

Examples: Withdrawing hand from hot object, blinking when something comes near the eye, knee-jerk reflex.

Reflex arc (pathway): Receptor --> Sensory neuron --> Spinal cord (relay neuron) --> Motor neuron --> Effector (muscle)

The reflex arc is a short-circuit. It bypasses the brain for faster response to provide survival advantage.

4. What are the three main parts of the human brain?

1. Forebrain or Cerebrum, is the largest part of the brain. It controls thinking, reasoning, memory, learning, voluntary movements. It also processes sensory information like sight, hearing, smell, taste, touch.

2. Midbrain controls visual and auditory reflexes. eg: pupil reflex, head movement toward sound

3. Hindbrain has Cerebellum and Medulla oblongata. Cerebellum controls balance, posture, and coordination of movements. Medulla oblongata controls involuntary actions like breathing, heartbeat, swallowing, blood pressure.

6. What are tropisms in plants? Name four types.

A tropism is a directional growth movement made by a plant in response to an environmental stimulus. The direction of growth is determined by the source of the stimulus. Unlike animals, plants cannot walk away from danger or toward resources, so they adjust their growth to adapt to their surroundings.

Phototropism - Growth towards a light source.

Gravitropism - Roots grow downward, while shoots grow upward, in response to gravity.

Thigmotropism - Growth response to contact, often seen in climbing vines.

Hydrotropism - Roots navigating towards water sources.

5. What are the differences between voluntary and involuntary actions?

voluntary actions	involuntary actions
controlled by cerebrum (forebrain)	controlled by medulla or spinal cord
They are slower processes and involve thinking	They are faster processes and doesn't involve thinking
Person is aware of actions and can choose	Person has no voluntary control
eg: writing, talking, walking	eg: heartbeat, breathing, digestion, pupil reflex

7. Write a note on Auxin

Auxin is a vital plant hormone synthesized at the tips of growing shoots that promotes cell elongation, which in turn causes growth.

When a plant detects light from one direction, auxin diffuses toward the shaded side of the shoot. This high concentration of the hormone stimulates the cells on the darker side to grow longer than those on the illuminated side. Consequently, this differential growth causes the stem to bend towards the light source, a phenomenon known as phototropism.

8. What is the role of Gibberellins and and Cytokinins?

They are growth promoting plant hormones.

Gibberellins promotes growth of stem and seed germination.

Cytokinins promotes rapid cell division and present in high concentration in areas of rapid growth like fruits and seeds.

9. What is the role of Abscisic acid in plant?

Abscisic acid acts as a growth inhibitor that counteracts growth promoters and causes the wilting and falling of leaves.

9. Compare nervous and endocrine system

Nervous System	Endocrine System
Message travels through electrical impulse along the nerve cells	Message travels through hormones which are chemicals, via blood
Message travels fast (few milliseconds)	Message travels slow (seconds to hours)
Message is short lived.	Message is long lasting.
Messages are precise and travels in specific nerve pathway	Hormones reach all cells, but only target cells respond
Eg: Reflex actions, voluntary movements	Eg: Growth, puberty, metabolism