Class 10 Science · Chapter 6: Control and Coordination

Answer key and marking scheme · 20 marks · about 40 minutes · based on NCERT

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1. After an injury to the back of the head, a patient has difficulty controlling his blood pressure and cannot stop frequent vomiting. The part of the brain most likely damaged is the [1]

(a) cerebellum
(b) medulla
(c) fore-brain
(d) hypothalamus

Answer: (b) Involuntary actions including blood pressure, salivation and vomiting are controlled by the medulla in the hind-brain.

2. A tea taster sips a cup and judges how sweet it is. The receptors on her tongue that respond to the sugar are [1]

(a) olfactory receptors
(b) motor neurons
(c) gustatory receptors
(d) relay neurons

Answer: (c) Gustatory receptors detect taste; olfactory receptors detect smell. Neurons that carry messages to muscles or within the spinal cord are not receptors.

3. A small animal with very little of the complex neuron network needed for thinking steps on a sun-heated stone and pulls its leg back at once. It can respond so quickly because [1]

(a) the response runs through a reflex arc, which does not wait for the brain's thinking
(b) its muscles contract on their own without any nerves
(c) its receptors for heat lie inside the spinal cord
(d) thinking in such an animal is faster than a reflex

Answer: (a) Reflex arcs connect the nerves that detect heat directly to the nerves that move muscles. They evolved because thinking is not fast enough, and many animals have little or none of the network needed for thinking; muscles still need nerves, and receptors lie in the sense organs.

4. Which two together make up the central nervous system? [1]

(a) the brain and the cranial nerves
(b) the brain and the spinal cord
(c) the spinal cord and the spinal nerves
(d) the cranial nerves and the spinal nerves

Answer: (b) The brain together with the spinal cord constitutes the central nervous system; the cranial and spinal nerves form the peripheral nervous system.

5. The withdrawal of a foot from a sharp nail does not wait for a conscious decision because [1]

(a) the muscles of the leg are not connected to the brain
(b) the brain never receives any information about the nail
(c) thinking involves many impulses through many neurons and would take too long
(d) receptors in the skin send their signals only to the spinal cord

Answer: (c) Thinking is a complex activity involving many nerve impulses from many neurons, so it is too slow; reflex arcs give the quick response. The information still goes on to the brain, so it is not true that the brain receives nothing or that the signal stops at the spinal cord.

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6. Twins Aman and Aarti, aged 11, both begin to show changes in appearance. Name the hormone responsible for these changes in each of them. [2]

These changes of puberty are caused by the secretion of testosterone in males (Aman) and oestrogen in females (Aarti).

- testosterone in Aman (male) (1)
- oestrogen in Aarti (female) (1)

7. A doctor feels the front of a patient's neck for one endocrine gland and orders a scan of the top of the kidneys for another. Name the two glands. [2]

The thyroid gland lies in the neck; the adrenal glands lie on top of the kidneys.

- thyroid gland (neck) (1)
- adrenal glands (on top of the kidneys) (1)

8. Messages pass between a sprinter's central nervous system and the muscles of his legs and face. Name the two kinds of nerves of the peripheral nervous system and state where each arises. [2]

Cranial nerves arise from the brain; spinal nerves arise from the spinal cord. Together they form the peripheral nervous system.

- cranial nerves, arising from the brain (1)
- spinal nerves, arising from the spinal cord (1)

9. A plant physiologist studies one bean plant. Name the plant hormone most involved in each: (i) rapid cell division in the developing pods and seeds, (ii) the lengthening of the stem, besides auxin, (iii) the wilting of leaves as growth slows during a dry spell. [3]

(i) Cytokinin promotes cell division and is concentrated where cells divide rapidly, such as fruits and seeds. (ii) Gibberellin, like auxin, helps in stem growth. (iii) Abscisic acid inhibits growth; its effects include wilting of leaves.

- (i) cytokinin (1)
- (ii) gibberellin (1)
- (iii) abscisic acid (1)

10. A child walking barefoot steps on a thorn and lifts her foot at once. Trace the path of the signal from the thorn to the muscle that lifts the foot, naming each part, and state what else happens to the information. [3]

Receptors in the skin of the sole detect the prick and send the signal along a sensory neuron into the spinal cord. A relay neuron inside the cord passes it to a motor neuron, which carries it to the effector, the leg muscle, which lifts the foot. A separate message travels up the spinal cord to the brain.

- receptors in the skin → sensory neuron → spinal cord (1)
- relay neuron in the cord → motor neuron → muscle (effector) (1)
- information also travels on to the brain (1)

11. A model of the human brain in a school laboratory has three pieces: X, the large folded part on top; Y, a small part lying below and behind X; and Z, a group made of the pons, the medulla and the cerebellum. Name the region of the brain each piece stands for, and give one function of X and one of the cerebellum. [3]

X is the fore-brain (the cerebrum), Y the mid-brain and Z the hind-brain. The fore-brain is the main thinking part of the brain. The cerebellum maintains the posture and balance of the body and gives precision to voluntary actions.

- X fore-brain, Y mid-brain, Z hind-brain (1)
- X: the main thinking part (or receives sensory impulses) (1)
- cerebellum: posture and balance, or precision of voluntary actions (1)