CONTROL AND COORDINATION

NCERT Textbook Questions

Q.1. What is the difference between a reflex action and walking?

Ans. Reflex action is a rapid, automatic response to a stimulus which is not under the voluntary control of thebrain. It is a kind of involuntary action which involves only the spinal cord. A reflex action is not based on our thinking. On the other hand, walking is a voluntary action which we undertake knowingly. The action of walking involves thinking by the brain. The central nervous system (brain and spinal cord) takes part in the action of walking.

Q.2. What happens at the synapse between two neurons?

Ans. The synapse is a microscopic gap between any two adjacent neurons. Electrical impulses (or nerve impulses)carrying messages pass over the synapse when going from one neuron to another. Actually, synapse between two neurons acts as a one-way valve which allows electrical impulses to pass in one direction only. This happens as follows: When an electrical impulse coming from the receptor reaches the end of the axon of sensory neuron, then the electrical impulse releases tiny amount of a chemical substance (called neuro-transmitter substance) into the synapse (or gap) between two adjacent neurons. This chemical substance crosses the synapse (or gap) and starts a similar electrical impulse in the dendrite of the next neuron. In this way, the electrical impulses (or messages) are passed from one neuron to the next across the synapse.

Q.3. Which part of the brain maintains posture and equilibrium of the body?

Ans. Cerebellum.

Q.4. How do we detect the smell of an agarbatti (incense stick)?

Ans. When the agarbatti burns, it produces vapours having a characteristic pleasant smell. This smell is detectedby the olfactory receptors present inside our nose. The action of smell of agarbatti on receptors sets off chemical reactions which generate electrical impulses. The sensory neurons carry these electrical impulses to the sensory area of forebrain (called cerebrum). This makes us detect the smell of burning agarbatti.

Q.5. What is the role of the brain in reflex action?

Ans. Reflex action takes place in the spinal cord. Only the information that a reflex action has taken place goes on to reach the brain.

Q.6. What are plant hormones?

Ans. The organic chemical substances produced in plants which control growth, development and responses inplants, are called plant hormones. The examples of plant hormones are: Auxins, Gibberellins, Cytokinins and Abscisic acid.

Q.7. How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light?

Ans.

Movement of sensitive plant	Movement of shoot towards light
The movement of leaves of the sensitive plant is a nastic movement.	The movement of a shoot towards light is a tropic movement.
It does not depend on the direction of the stimulus.	It depends on the direction of the light source.
It is not a growth movement.	It is a growth movement.

Q.8. Give an example of a plant hormone that promotes growth.

Ans. Auxin

Q.9. How do auxins promote the growth of a tendril around a support?

Ans. When tip of tendril supports the growth of a tendril around a support, the auxin moves away to the opposite part. It helps the cell grow longer. When a tendril comes in contact with a support, auxins stimulates faster growth of the cells on the opposite side. This continual growth of shoot tip forms tendril and starts coiling towards the support.

Q.10. Design an experiment to demonstrate hydrotropism.

Ans. (*i*). Take two glass troughs A and B.

(*ii*). Fill each one of them with two-thirds of soil.

(*iii*). In trough B, we plant a similar seedling and place a small clay pot inside the soil.

(*iv*). Water the soil in the trough A daily and uniformly.

(*v*). Do not water the soil in trough B, but put some water in the clay pot placed in the soil.

(*vi*). Leave both the troughs for a few days.

On examining the roots later, it will be found that the root in trough B has bent towards the source of water. Roots in trough A grew normally straight.

Q.11. How does the chemical coordination take place in animals?

Ans. The chemical coordination in animals takes place through the action of chemicals called 'hormones'. Hormones are the chemicals which are made inside the animal body in very

small amounts by certain glands. Hormones are released directly into the blood. They are carried by the blood circulatory system to other parts of the body. Hormones travel all over the body but affect only particular organs at particular places. The organs which they affect are called target organs. The hormones control and coordinate several functions of the animal body such as growth, development, metabolism, behaviour and secondary sexual characteristics, etc.

Q.12. Why is the use of iodised salt advisable?

Ans. Iodine is necessary for the thyroid gland to make thyroxine hormone. Thyroxine hormone regulates the metabolism of carbohydrates, fats and proteins so as to produce the best balance for growth. If there is deficiency of iodine in our diet, the formation of thyroxine hormone will be reduced and lead to a disease called goitre. One of the symptoms of goitre disease is that the neck of the person appears to be swollen. Iodised salt contains appropriate amounts of iodine compounds. Iodised salt can provide all the iodine needed by the thyroid gland to make sufficient thyroxine hormone for the body. So, if we take iodised salt, there can be no deficiency of iodine (or thyroxine) in the body and hence goitre disease can be prevented.

Q.13. How does our body respond when adrenaline is secreted into the blood?

Ans. The adrenaline hormone prepares our body to function at maximum efficiency during emergency situations like danger, anger, excitement, etc. This happens as follows: When we are faced with a dangerous situation (like being chased by a ferocious dog), then our nervous system stimulates the adrenal glands to secrete more adrenaline hormone into our blood. This adrenaline hormone increases our 'heart beats', 'breathing rate', 'blood flow into muscles' and causes liver 'to put more stored glucose into our blood'. All these actions of adrenaline hormone produce a lot of energy in our body very, very quickly. And this energy helps us to cope up with emergency situations (like running away very fast from a ferocious dog or fighting an enemy, etc.).

Q.14. Why are some patients of diabetes treated by giving injections of insulin?

Ans. Insulin is a hormone which is produced and secreted by a gland called pancreas. The function of insulin hormone is to lower the blood sugar level. Deficiency of insulin hormone in the body raises the blood sugar level causing a disease known as diabetes. The high sugar level in the blood of a diabetic person can lead to many harmful effects. Some persons having diabetes are treated by giving injections of insulin because addition of insulin hormone to blood lowers the blood sugar level.

NCERT Exercises

Q.1. Which of the following is a plant hormone?

(*a*) Insulin (*b*) Thyroxin (*c*) Oestrogen (*d*) Cytokinin

Ans. (*d*) Cytokinin.

Q.2. The gap between two neurons is called a:

(*a*) dendrite (*b*) synapse (*c*) axon (*d*) impulse

Ans. (*b*) synapse.

Q.3. The brain is responsible for:

(*a*) thinking (*b*) regulating the heart beat

(*c*) balancing the body (*d*) all of the above

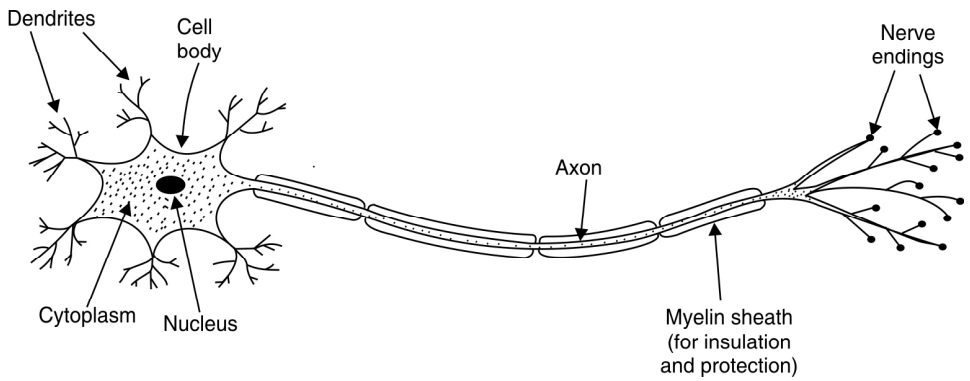
Ans. (*d*) all of the above.

Q.4. What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to arise?

Ans. Receptors are the special cells present in our sense organs. Receptors detect all the information from our environment and feed it to the nervous system. For example, gustatory receptors present in our tongue detect taste of our food whereas olfactory receptors present in our nose detect smell. Now, if the gustatory receptors of our tongue do not work properly, we will not be able to know the taste of different types of foods (whether sweet, salty, sour or bitter, etc.). And if the olfactory receptors present in our nose do not work properly, we will not be able to smell things (like the flavour of a food or the fragrance of a perfume).

Q.5. Draw the structure of a neuron and explain its function.

Ans. A neuron consists of three parts: cell body, dendrites and axon (see Figure on next page). The cell body of a neuron is like a typical animal cell which contains cytoplasm and a nucleus. A number of long and thin fibres stretch out from the cell body of a neuron. They are called nerve fibres. The shorter fibres on the cell body of a neuron are called dendrites.

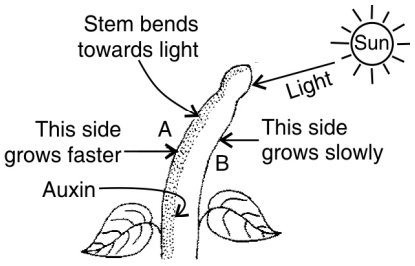


A neuron.

The longest fibre on the cell body of a neuron is called axon. The axon has an insulating and protective sheath (or cover) of myelin around it. The function of neurons is to carry messages over long distances in the body of a person quickly. The messages which neurons transmit in nervous system are in the form of electrical impulses (also called nerve impulses). Actually, neurons make the whole nervous system work efficiently. For example, the sensory neurons transmit impulses from the sensory cells or receptors (present in sense organs) towards the central nervous system (spinal cord and brain). And the motor neurons transmit impulses from the central nervous system towards the muscle cells (or effectors) for taking appropriate action.

Q.6. How does phototropism occur in plants?

Ans. The bending of a plant stem towards light is an example of phototropism. The plant stem responds to light and bends towards it due to the action of 'auxin hormone'. This happens as follows: The auxin hormone is present in the tip of the stem of the growing plant. The auxin hormone prefers to stay in shade, away from light. So, when sunlight falls on the stem from one side, auxin hormone gets concentrated on the side of the stem which is away from light. Auxin promotes growth. So, due to more auxin, the shady side of stem (which is away from light) grows to be longer than the side of stem which is facing light, and makes the stem bend towards light. For example, in Figure given here, the left side A of the stem (which is away from light) has more auxin hormone and grows faster than right side B which is towards light. Since side A of stem becomes longer than side B, the stem bends towards right side (in the direction of light).



Mechanism of phototropism.

Q.7. Which signals will get disrupted in case of a spinal cord injury?

Ans. Reflex actions and involuntary actions will get disrupted in case of a spinal cord injury.

Q.8. How does chemical coordination occur in plants?

Ans. The plants do not have nervous system but they can still sense things. The plants can sense the presence of stimuli such as light, gravity, chemicals, water, and touch, etc., and respond to them by the action of hormones. Thus, the plants coordinate their behaviour against environmental changes by using organic chemicals called hormones. This is called 'chemical coordination'. The hormones in plants coordinate their behaviour by affecting the growth of a part of the plant resulting in the movement of that plant part in response to a stimulus. For example, when sunlight falls on a shoot from one side, the auxin hormone causes the shady side of shoot to grow faster, making the shoot bend towards sunlight.

Q.9. What is the need for a system of control and coordination in an organism?

Ans. An organism needs a system of control and coordination for its survival in this world. The system of control and coordination is necessary in plants as well as animals (including human beings).

(*i*) The plants need carbon dioxide, water and sunlight. It is due to the presence of a hormonal system of control and coordination in plants that the stomata in their leaves open to allow in carbon dioxide gas, the roots bend towards water and the shoots grow towards sunlight. It is also due to control and coordination that tendrils in plants having weak stems make them climb on to neighbouring supports.

(*ii*) In human beings, the system of control and coordination is needed for all our actions, thinking and behaviour. The human nervous system receives information from the surroundings, processes it and then responds accordingly. Our heart beats, breathing, reading, writing, cycling, dancing and various reflex actions are all because of the nervous system. The hormonal system (endocrine system) helps in controlling and coordinating activities like metabolism, development, reproduction and preparing our body to cope up with grave situations.

Q.10. How are involuntary actions and reflex actions different from each other?

Ans. Involuntary actions are those which we cannot control even if we want to. There is no stimulus involved in the involuntary actions. They take place on their own. For example, our heart beats all the time without our thinking about it. So, the beating of heart is a purely involuntary action. Involuntary actions are regulated by the brain. The reflex actions are also a kind of involuntary actions but they take place in response to a stimulus. For example, the decrease in the size of the pupil of our eye on stepping out in bright light is a reflex action which takes place in response to a stimulus 'light'. Reflex actions are usually regulated by the spinal cord.

Q.11. Compare and contrast nervous and hormonal mechanisms for control and coordination in animals.

Ans.

Neural Control	Hormonal control
1. It involves transmission of nerve impulses between brain, PNS and CNS.	1. It involves the endocrine system, where special chemical messengers or hormones are secreted in the blood.
2. The response time is short.	2. The response time is long.
3. The information travels fast.	3. Flow of information is slow.
4. Nerve impulses do not have specific action.	4. Hormones have specific actions.

Q.12. What is the difference between the manner in which movement takes place in a sensitive plant and the movement in your legs?

Ans. The movement of a sensitive plant are due to nastic movements which take place due to the change in turgor pressure at the base of the leaves. The change in turgor pressure causes leaves to droop. The movement in our legs is due to the contraction and relaxation of muscles.