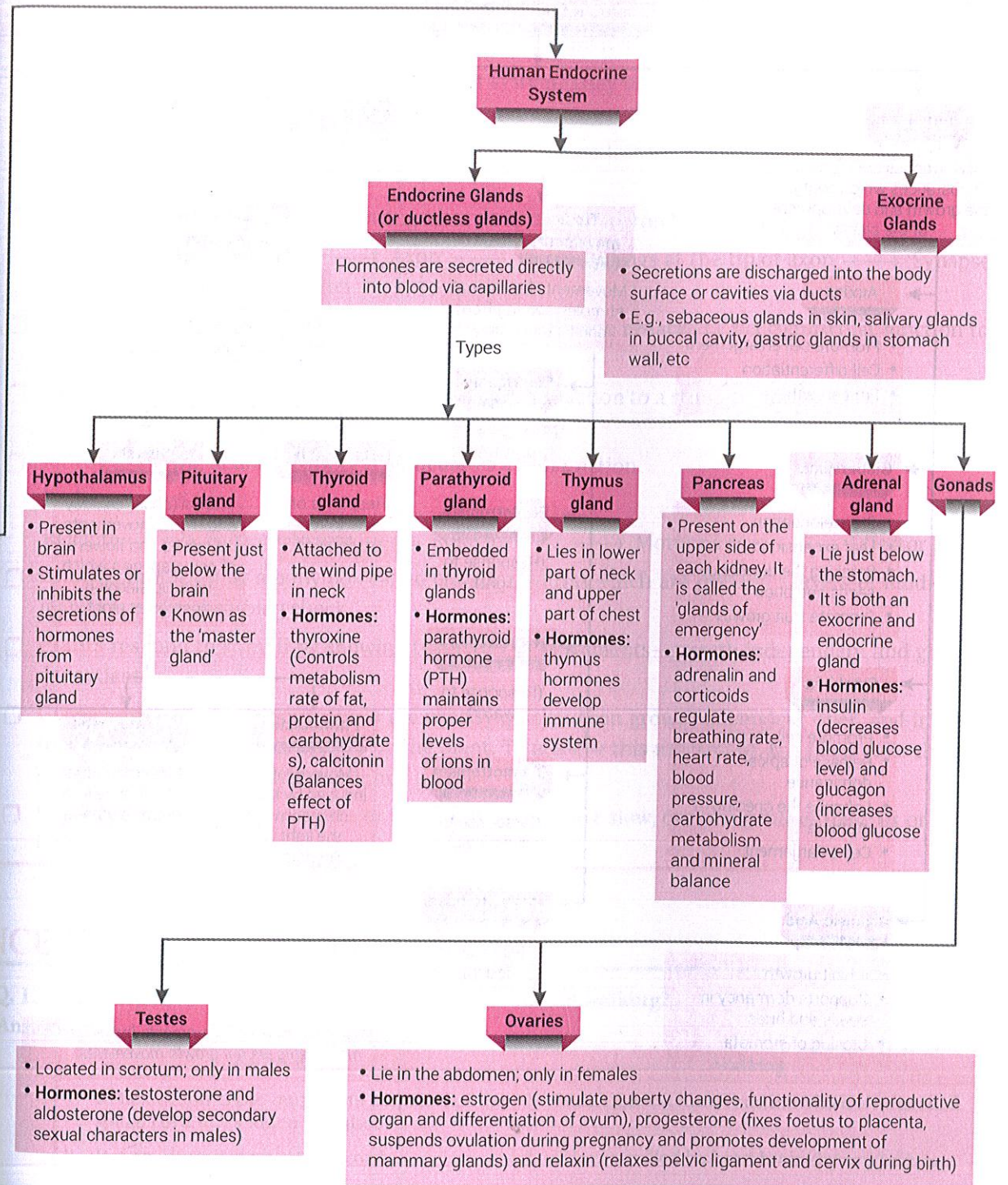
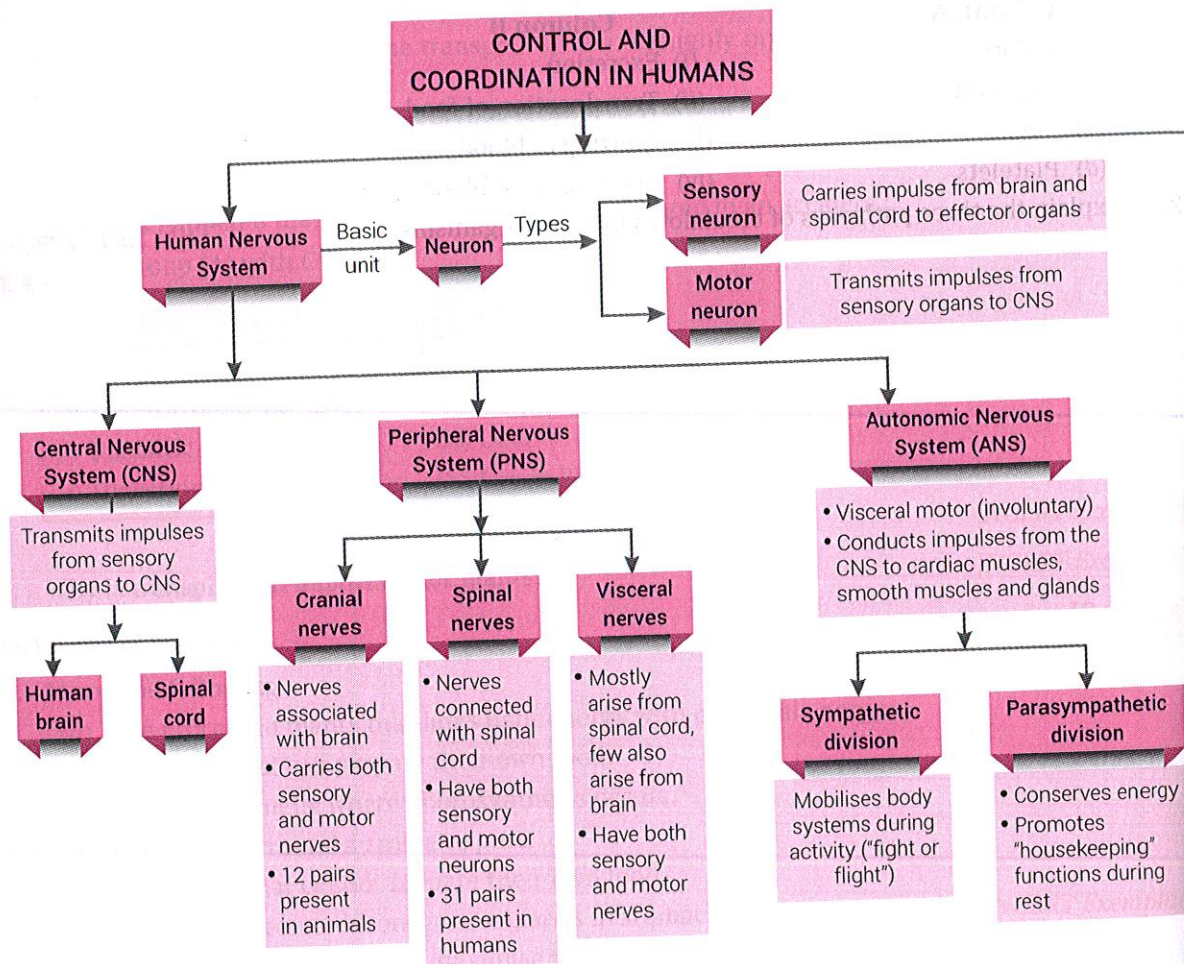


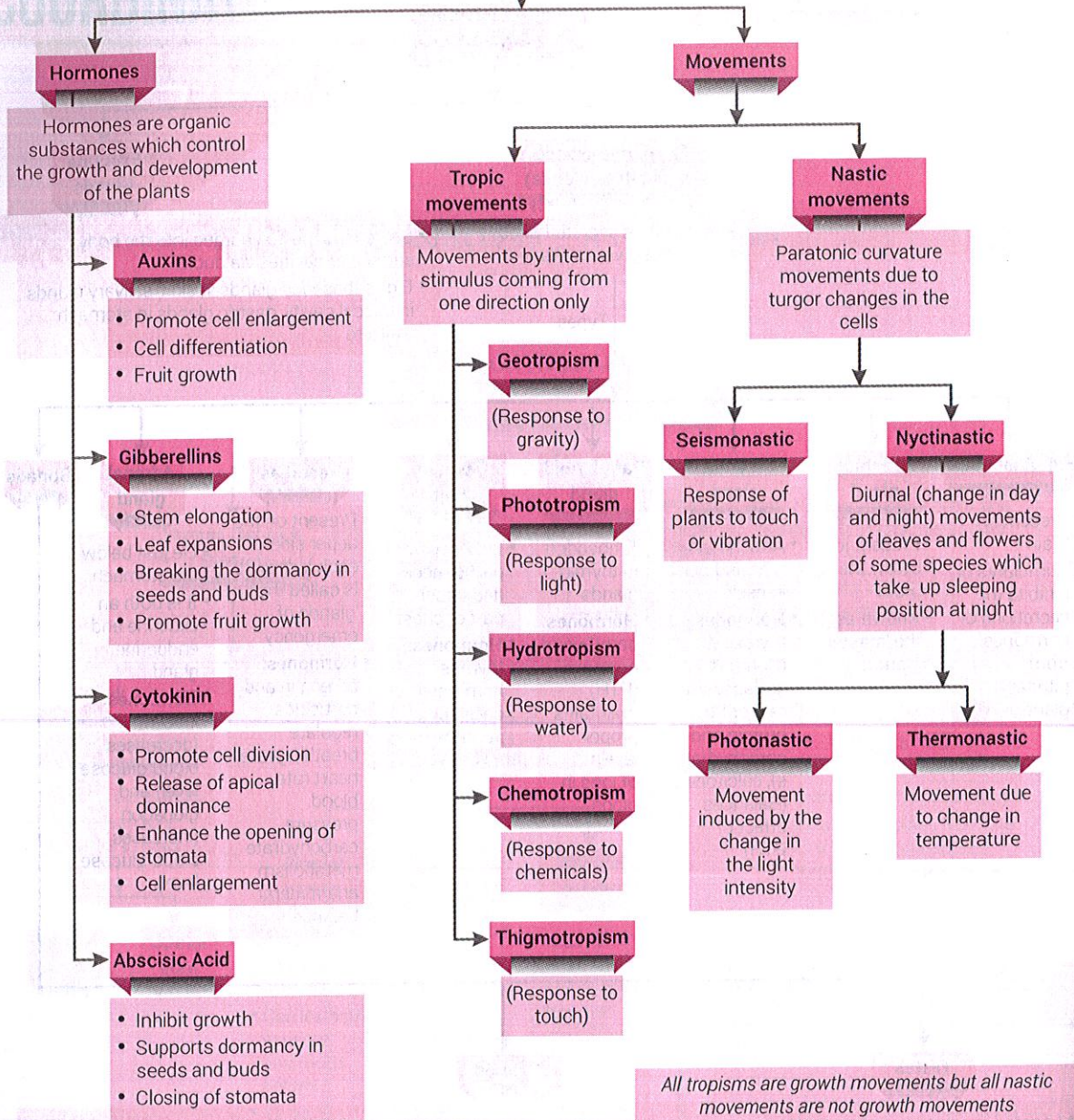
# CONTROL AND COORDINATION

## CHAPTER 7

### BASIC CONCEPTS – A FLOW CHART



## CONTROL AND COORDINATION IN PLANTS



## MORE POINTS TO REMEMBER

- ❑ In animals, the nervous system and hormonal system are responsible for control and coordination.
- ❑ **Neurons** are specialised cells of the nervous system. They use electrical and chemical signals for transferring information.
- ❑ **Receptors** are specialised tips of the nerve fibres that collect the information to be conducted by the nerves.
- ❑ **Nerve** impulses travel in the following manner from one neuron to the next  
Dendrites → Cell body → Axon → Nerve endings at the tip of axon → Synapse → Dendrite of next neuron
- ❑ **Chemicals** released from axon tip of one neuron, cross the synapse or neuromuscular junction to reach the next cell (neuron or muscle fibre).
- ❑ **Reflex action** is an automatic, rapid and immediate reaction to a stimulus and is below the level of consciousness. No thinking is involved in reflex action.
- ❑ **Reflex arc** is the neural pathway that mediates a reflex action.  
Pathway of reflex arc:  
Receptor → Sensory neuron → Relay neuron → Motor neuron → Effector
- ❑ **Brain** is protected by a bony box called cranium, within which are present 3 layers of fluid-filled membranes for absorbing shock.
- ❑ **Plants** respond to stimuli by showing two types of movements—growth independent and growth dependent.
- ❑ **Growth independent movements** are usually quicker than growth dependent ones, and involve the use of electrochemical signals by the plant. To achieve this movement, the plant cells change shape by altering their water content.
- ❑ **Growth dependent movements** or tropic movements are slow, occurring either towards or away from the stimulus.

## NCERT Intext Questions

Q. 1. What are the differences between a reflex action and walking?

Ans.

Reflex action	Walking
1. Reflex action is the immediate response of the spinal cord to a sudden impulse.	1. Walking is a voluntary action which is controlled.
2. It is conducted by the spinal cord.	2. It is controlled by hind-brain (by cerebellum).
3. It occurs in a fraction of seconds.	3. It takes longer time.

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

Ans. The neurons lie end-to-end in a chain to transmit the impulses in an animal body. There occurs a very minute gap between terminal portion of axon of one neuron and dendron of the other neuron. This gap is called synapse. At the end of the axon, the electrical impulse sets off the release of some chemicals. These chemicals cross the gap (synapse), and start a similar electrical impulse in the dendrite of the next neuron.

Synapses actually act like one way valves. This is because the chemical substance is present at only one side of the gap. In this way synapses ensure that nerve impulse travels only in one direction.

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

**Ans.** Cerebellum in the hind-brain maintains posture and equilibrium of the body.

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

**Ans.** The olfactory receptors in our nose detect the smell of agarbatti. The information in the form of nerve impulse is transmitted to olfactory lobes of fore brain. The message is interpreted there.

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

**Ans.** The reflexes which involve only the spinal cord are called spinal reflexes. The spinal reflexes are produced in the spinal cord but the message of reflex action taken also goes on to reach the brain where the thinking process occurs. Some reflex arcs involve the brain, rather than the spinal cord only. They are called cerebral reflexes. Closing of eyes when exposed to flash of light and salivation at the sight of tempting food are the examples of cerebral reflexes.

**Q. 6. What are plant hormones?**

**Ans.** In plants, certain chemical substances are necessary for proper growth and development. These chemical substances are called plant hormones or phytohormones. Different plant hormones help to coordinate growth, development and responses to the environment. For example, auxins, gibberellins, cytokinins, ethylene and abscisic acid are plant hormones.

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

**Ans.** Movement in the leaves of a sensitive plant (*Mimosa pudica*) occurs due to turgor changes in the cells which causes drooping of leaves/leaflets. Movement of a shoot towards light is a phototropic movement which is caused due to differential growth that occurs due to more concentration of auxins in one side.

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

**Ans.** Auxin is the plant hormone that helps in cell elongation and growth.

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

**Ans.** The movement of tendril around the support is caused by the hormone auxin. Less auxin occurs on the side of contact as compared to the free side. Auxin promotes the growth on the free side. As a result of growth on the free side, the tendril coils around the support.

**Q. 10. Design an experiment to demonstrate hydrotropism.**

**Ans.** Experiment to demonstrate hydrotropism:

(I) Take a wire mesh and cover it with moist saw dust.

(II) Place some germinated seedling (pea or gram) on the moist saw dust.

(III) Keep the saw dust moist by sprinkling water at regular intervals. Observe after 2-3 days.

(IV) As the radicals come out of the seeds, they are seen to move towards the perforation. After some growth they bend back and enter the perforations to reach the moist saw dust in complete disregard of gravity (positive hydrotropism).

**Conclusion:** Bending of radicals back into moist saw dust is a hydrotrophic movement. It occurs despite being against the force of gravity.

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

[NCERT Exemplar]

**Ans.** In animals, chemical coordination is achieved through the agency of hormones which function as chemical messengers or informational molecules. Hormones are secreted in a very small amount by specialised tissues in the body called endocrine glands. These glands are ductless and pour their secretions directly into blood. Blood transports them to the target tissues/organs.

Hormones coordinate the activities of living organisms and also their growth. For example, pancreas secretes two hormones—insulin and glucagon.

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

**Ans.** Iodine is necessary for the thyroid gland to make the hormone thyroxine. Thyroxine regulates carbohydrate, protein and fat metabolism in the body to provide balance for growth. Deficiency of iodine can lead to goitre.

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

**Ans.** Adrenaline hormone is secreted in small amounts all the time but in large amounts it is secreted when a person is frightened. It then prepares our body for action. It increases the rate of heartbeat and breathing, raises blood pressure and allows more glucose to go into the blood to give us a lot of energy so as to quickly fight or run away from the frightening situation. Adrenaline is termed as 'hormone of emergency'.

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

**Ans.** The insulin hormone controls the metabolism of sugar. When pancreas does not produce or secrete sufficient amount of insulin into blood, then the sugar level in the blood rises. Therefore, the patient excretes sugar (glucose) in urine, feels excessive thirst and also urinates excessively. The people having severe diabetes are treated by giving injections of insulin.

## NCERT Exercises

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

(a) Insulin

(b) Thyroxine

(c) Oestrogen

(d) Cytokinin

**Ans.** (d)

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

(a) dendrite

(b) synapse

(c) axon

(d) impulse

**Ans.** (b)

**Q. 3. The brain is responsible for**

(a) thinking

(b) regulating the heartbeat

(c) balancing the body

(d) all of the above

**Ans.** (d)

**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?**

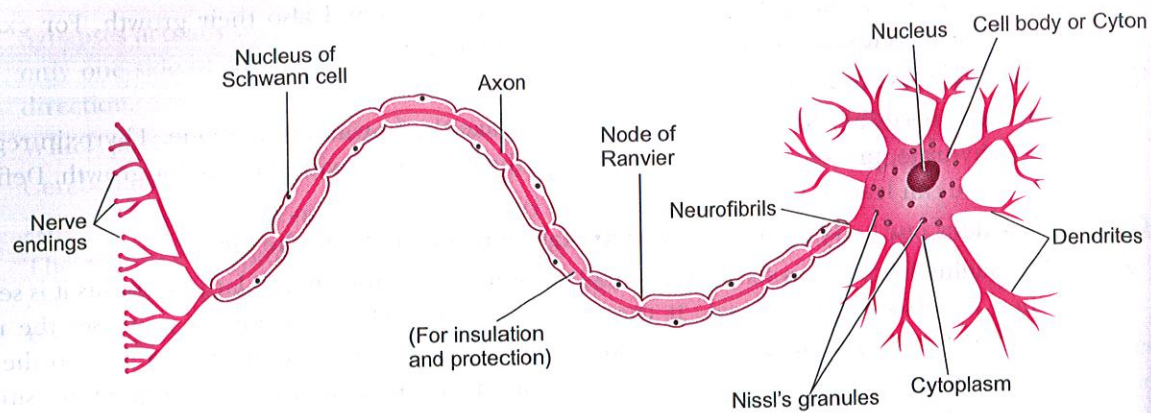
**Ans.** The receptors in our body collect information about changes in the environment around us in the form of stimuli, e.g., photoreceptors, gustatoreceptors, olfactory receptors. These receptors then pass the information in the form of nerve impulses to central nervous system (spinal cord and/or brain) where message is interpreted and appropriate instructions are sent to effectors (glands or muscles) which reveal responses. When receptors do not function normally, the environmental stimuli are not able to create nerve impulses and body does not respond. For example, if our gustatory receptors located in the tongue do not work properly we will not perceive the taste of food such as sour, sweet, salty or bitter.

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

[NCERT Exemplar]

**Ans.** Neuron or nerve cell is a structural and functional unit of the nervous system that is specialised to receive, conduct and transmit nerve impulses.

A neuron (nerve cell) has three components: (i) Cell body (cyton), (ii) Dendrites, (iii) Axon



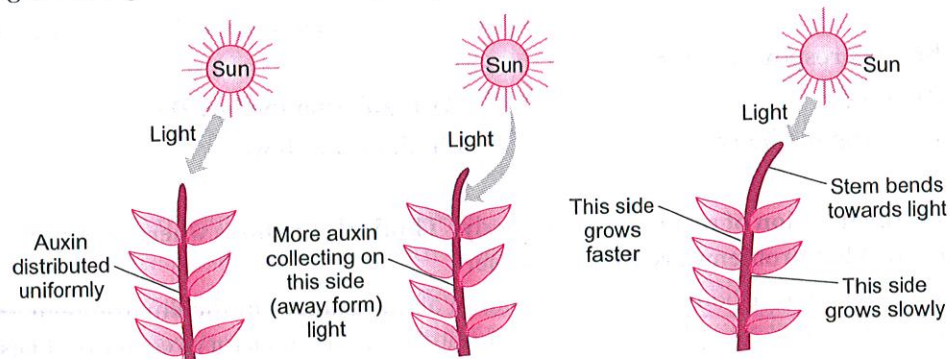
**A neuron (nerve cell)**

**Functions:** The information acquired at the end of the dendritic tip of a neuron sets off a chemical reaction which creates an electrical impulse. This impulse travels from the dendrite to the cyton along the axon of its end. At the end of axon, the electrical impulse sets off the release of some chemicals, which cross the synapse and start a similar electrical impulse in a dendrite of the next neuron. In this way, nerve impulses travel in the body, from one neuron to another till it reaches the brain or the target organ. Thus, a nervous tissue is made up of an organised network of nerve cells or neurons which are specialised in conducting information via electrical impulse from one part of the body to another.

**Q. 6. How does phototropism occur in plants?**

**Ans.** The directional movement of a plant part/plant in response to light is called phototropism. The shoot responds by bending towards light while roots respond by bending away from the light. We know that the plant stem responds to light and bend towards it due to the action of auxin hormone. This happens as follows.

(i) When sunlight falls on the plant, the auxin hormone present at the tip of the stem spreads uniformly down the stem. Due to the equal presence of auxin, both the sides of the stem grow straight and with same rapidity.



**Experiment to show the effect of auxin on the growth of a plant in response to light (Phototropism)**

(ii) When the light falls only on the right side of the stem, then the auxin hormone collects in the left side of the stem, away from the light. This is because auxin hormone prefers to stay in shade, i.e., moves away from the light. Thus, more auxin hormone is present in the left side of stem as compared to the right. The left side of stem, grows faster than its right side and therefore, the stem bends towards the right side (direction of light).

The effect of auxin on the growth of a root is exactly opposite to that on a stem. Auxin hormone increases the rate of growth in stem but it decreases the rate of growth in a root. The side of root away from light will have all the auxin concentrated in it. Due to this, the side of root which is away from light will grow slower than the other side and make the root bends away from light.

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

**Ans.** In case of a spinal cord injury, reflex actions and involuntary actions will get disrupted.

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

**Ans.** In plants, chemical coordination occurs with the help of plant hormones (phytohormones). Different plant hormones help to coordinate growth, development and responses to the environment. They are synthesised at places away from where they act and simply diffuse to the area of action, for example, auxin. Another example of plant hormones are gibberellins which help in growth of the stem. Cytokinins promote cell division. Abscisic acid is a plant hormone which inhibits growth and its effects include wilting of leaves.

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

**Ans.** The body of a multicellular organism consists of a number of components and sub-components and each is specialised to perform a particular function. Therefore, it is necessary that various organs of the body of an organism work together in a proper manner to carry out various functions and respond to stimuli. In human beings, nervous system and endocrine system work together to control and coordinate.

**Q. 10. Compare and contrast nervous and hormonal mechanisms for control and coordination in animals.**

**Ans.**

S.No.	Nervous Control	Hormonal Control
1.	Information is passed as electrochemical conduction.	Information is sent as a chemical substance through the blood stream.
2.	Information travels rapidly; in milliseconds.	Information travels slowly.
3.	Response is immediate.	Response is usually slow.
4.	Its effects are short-lived.	Its effects are generally more prolonged.

**Q. 11. How are involuntary actions and reflex actions different from each other?**

**Ans.**

S.No.	Involuntary Actions	Reflex Actions
1.	They involve autonomic nervous system.	They involve all parts of voluntary nervous system.
2.	They usually occur in response to internal stimuli.	They operate against harmful stimuli which are generally external and may cause injury.
3.	They are connected with functioning of internal body parts.	They are connected with emergency.
4.	These are regulated by medulla (hind-brain).	Reflex action is controlled by spinal cord.
5.	The speed of response is slower.	The speed of response is very fast.
6.	Example: Beating of heart muscle.	Example: Removal of hand with jerk when someone touches a hot object accidentally.

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

**Ans.**

S.No.	Movement in Sensitive Plant	Movement in Legs
1.	It occurs in response to an external stimulus like touch and shock.	It occurs in response to our requirement and is determined by will.
2.	Plant cells change shape by changing the amount of water (turgor changes).	Movement in our legs is a voluntary action which is controlled by cerebellum in hind-brain.
3.	No nerves are involved.	Nerves carry the message for movement of legs.
4.	It is controlled by plant hormones.	It is controlled by nerves and cerebellum in hind-brain.

## VERY SHORT ANSWER QUESTIONS

[1 mark]

Q. 1. Mention the receptors for light and sound in animals.

Ans. Sense organs are called receptors. The receptor of light in animals is called photoreceptor. The receptor of sound in animals is called phonoreceptor.

Q. 2. Which hormone regulates the concentration of sugar in the blood?

Ans. Insulin secreted by Islets of Langerhans of pancreas.

Q. 3. Define 'reflex action.'

Ans. Reflex action is a rapid, automatic response to a stimulus which is not under the voluntary control of the brain.

Q. 4. Name few involuntary actions controlled by the hindbrain.

Ans. Involuntary actions controlled by hindbrain are vomiting, salivation and blood pressure.

Q. 5. What is an axon?

Ans. It is a large, single, unbranched nerve fibre arising from the cyton. It carries impulses from cyton located in CNS to effectors.

Q. 6. Why are roots called positively geotropic?

Ans. This is because the roots always grow towards the gravity of the Earth.

Q. 7. What is the number of cranial nerves and spinal nerves in human beings?

Ans. There are 12 pairs of cranial nerves and 31 pairs of spinal nerves in human beings.

Q. 8. Name the largest cell present in the human body.

Ans. Neuron

Q. 9. Which part of central nervous system controls reflexes?

Ans. Spinal cord

Q. 10. Name the part of neuron

(i) where information is acquired.

(ii) through which information travels as an electrical impulse.

Ans. (i) Dendrite, (ii) Axon.

Q. 11. What will happen if intake of iodine in our diet is low?

[NCERT Exemplar]

Ans. (i) When iodine intake is low, release of thyroxine from thyroid gland will be less by which protein, carbohydrate and fat metabolisms will be affected.

(ii) A person might suffer from goitre in case of iodine deficiency in the body.

Q. 12. Which hormone controls the metabolism of calcium and phosphorus in human beings?

Ans. Parathyroid hormone (parathormone)

Q. 13. Name the hormone, the secretion of which is responsible for dramatic changes in appearance in girls and boys when they approach 10-12 years of age.

Ans. Oestrogen from the ovaries of girls and testosterone from testes of boys.

Q. 14. Name two tissues that provide control and coordination in multicellular animals.

Ans. The two tissues that provide control and coordination in multicellular animals are nervous tissue and muscular tissue.

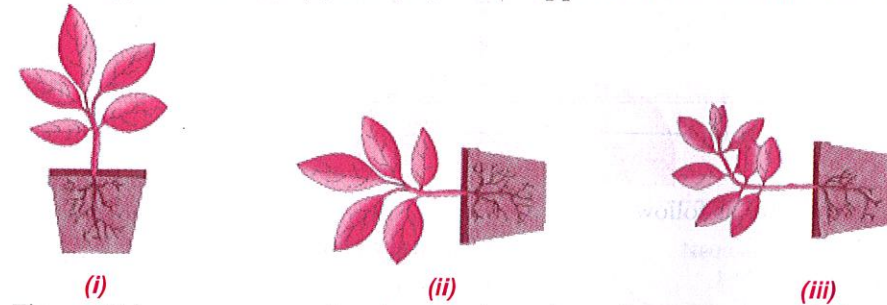
Q. 15. Which hormone helps in lowering the level of blood glucose in human beings?

Ans. Insulin

Q. 16. What do you understand by the sleep movement of plant organs?

Ans. Sleep movement in plants e.g., in flowers is to protect the reproductive organs from the cold. Hence, sepals and petals of saffron flower close at sunset and open up in the morning.

Q. 17. In the figure below (i), (ii) and (iii), which appears more accurate and why? [NCERT Exemplar]



Ans. Figure (i) is more appropriate because in a plant, shoots are negatively geotropic. Hence, they grow upwards and roots are positively geotropic so they grow downwards.

Q. 18. State the main function of abscisic acid in plants.

Ans. Abscisic acid slows plant growth and inhibits division of cells.

## SHORT ANSWER QUESTIONS-I

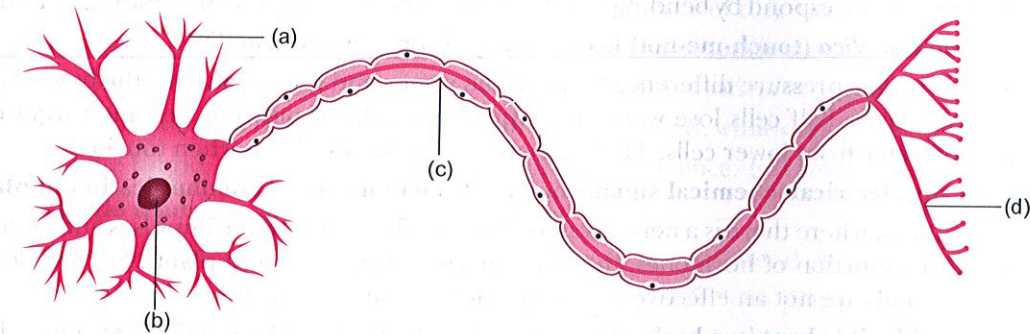
[2 marks]

Q. 1. Define a synapse.

Ans. Synapse is a very fine gap between telodendria of axon of one neuron and dendrites of another neuron. These two structures do not unite with each other but remain separated by a fine gap.

Q. 2. Label the marked parts of a neuron in the given figure.

[NCERT Exemplar]



Ans. (a) Dendrite (b) Cell body  
(c) Axon (d) Nerve endings

Q. 3. Mention the functions of forebrain.

Ans. The forebrain performs the following functions:

- (i) It is responsible for intelligence, memory, consciousness, will power and voluntary actions.
- (ii) It has the centres for visual reception, hearing reception, touch, smell and temperature reception.

Q. 4. Answer the following:

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

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

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

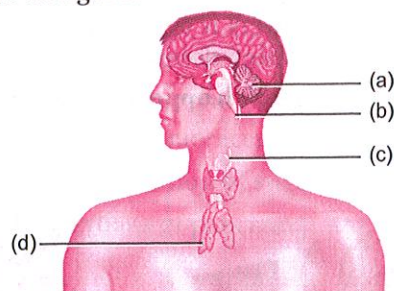
(iv) Iodine is necessary for the synthesis of which hormone?

[NCERT Exemplar]

Ans. (i) Oestrogen (ii) Growth hormone  
(iii) Insulin (iv) Thyroxine

Q. 5. Label the endocrine glands in figure.

[NCERT Exemplar]



Ans. The endocrine glands are as follow:

- (a) Pineal gland (b) Pituitary gland  
(c) Thyroid gland (d) Thymus

Q. 6. Name the hormones responsible for regulation of

- (i) metabolism of carbohydrates, fats and proteins.  
(ii) balance of calcium and phosphate.  
(iii) blood pressure.  
(iv) water and electrolyte balance.

Ans. (i) Thyroxine (ii) Parathormone  
(iii) Adrenaline (iv) Vasopressin

Q. 7. What is a tropic movement? Explain with an example.

[NCERT Exemplar]

Ans. The directional growth movement of plants due to external stimuli is called a tropic movement. It can be either towards the stimulus, or away from it. For example, in case of phototropic movement, shoots respond by bending towards light while roots respond by bending away from it.

Q. 8. Why *Mimosa pudica* (touch-me-not) leaves droop down when touched?

Ans. It is due to turgor pressure difference between the upper and lower halves of the base of petiole (pulvinus). Lower half cells lose water and upper half cells of pulvinus become turgid due to transfer of water from lower cells. Thus, the entire leaf droops down when touched.

Q. 9. Why are the electrical-chemical signals not an efficient means of communication in plants?

Ans. Unlike animals, where there is a nervous system for conduction of nerve impulses and circulatory system for conduction of hormones, there are no specialised tissues in plants. So, the electrical-chemical signals are not an effective means of communication in plants.

Q. 10. If a ripened fruit is kept in a basket of raw fruits, then what will happen? What causes it?

Ans. The ripened fruit will release ethylene (hormone) which causes ripening of other raw fruits kept in a basket.

Q. 11. What is cerebrospinal fluid? What is its function?

Ans. Cerebrospinal fluid is the fluid found in the cavities of brain and central canal of spinal cord and in between arachnoid and pia mater.

Function: It prevents the brain and spinal cord from mechanical shocks.

Q. 12. Answer the following:

- (a) Name the endocrine gland associated with brain.  
(b) Which gland secretes digestive enzymes as well as hormones?  
(c) Name the endocrine gland associated with kidneys.  
(d) Which endocrine gland is present in males but not in females?

[NCERT Exemplar]

Ans. (a) Pituitary (b) Pancreas  
(c) Adrenal (d) Testes

## SHORT ANSWER QUESTIONS-II

[3 marks]

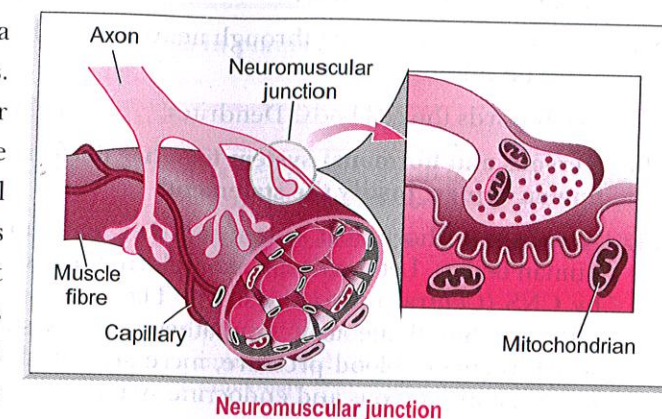
Q. 1. What are the advantages of the fact that most reflex actions are governed by spinal cord?

Ans. The advantages are:

- (i) This enables the body to give quick responses to harmful stimuli thus protecting the body.  
(ii) It minimises overloading of brain.  
(iii) In many animals, reflex arcs have evolved as efficient ways of functioning in the absence of true thought processes.

Q. 2. How do animal muscles move?

Ans. The nerve fibres at the end of a neuron are attached to muscles. This area is called neuro-muscular junction. When nerve impulses are conducted to this area, the special proteins present in the muscle cells change their shape and arrangement in the cell in response to nervous electrical impulses. New arrangement of these proteins give the muscle cells a shorter form thus bringing about movement of muscles.



Q. 3. What is turgor movement?

Ans. Turgor movement is the movement due to the difference of turgidity of the cells in the lower half and upper half of pulvinus (petiole of leaf). When leaf of touch-me-not plant (*Mimosa pudica*) is touched, the electrical signal send chemical signals from leaflets to pulvinus (petiole) of leaf. Cells in the lower half of pulvinus lose water and become flaccid, while cells in the upper half of pulvinus become turgid due to accumulation of more water. Hence, leaf droops down for a short time.

Q. 4. Why do tendrils coil around hard rough objects?

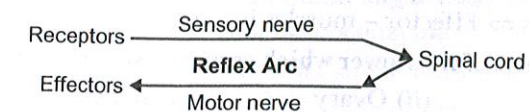
Ans. The growth movement of tendril in response to unilateral stimulus of touch is called thigmotropism. Tendrils of louni, tori, karela, and sweet pea plants coil around hard objects when they come in their contact. It occurs due to unequal growth of two sides of a tendril. The growth of the surface which comes in contact of the support is retarded, while it remains normal or increased on the other side, due to which tendril coils around the support.

Q. 5. Why is pancreas called a 'dual function' gland? Write the names of its hormones.

Ans. Pancreas is an exocrine gland as well as an endocrine gland. Exocrine part of the gland secretes digestive enzymes and the endocrine part (Langerhan's cells) produce hormones. Hormones secreted by pancreas are insulin and glucagon.

Q. 6. How is reflex arc formed?

Ans. A message or stimulus from receptor is relayed by sensory nerve to the spinal cord. It sends response through motor nerve to effectors for necessary action. This pathway is the reflex arc.



**Q. 7. How is the endocrine system able to maintain hormonal concentration in the body?**

**Ans.** Hypothalamus is responsible for maintaining the balance of hormones in the body. When any hormone is secreted in large amounts, a signal is sent by the hypothalamus to the secreting gland to lower its secretion.

Whereas when the amount of any hormone is less, hypothalamus sends a signal to the respective gland to increase its functioning.

**Q. 8. Define 'nerve impulse'. Which structure in a neuron helps to conduct a nerve impulse**

- (i) towards the cell body? (ii) away from the cell body?

**Ans.** The information passing through neurons is in the form of chemical and electrical signals, called nerve impulse.

- (i) Towards the cell body: Dendrites. (ii) Away from the cell body: Axon.

**Q. 9. Nervous and hormonal system together perform the function of control and coordination in human beings. Justify the statement. [NCERT Exemplar]**

**Ans.** Nervous and hormonal system together perform the function of control and coordination in human beings. Let us take an example, in the case of any emergency, stimulus is being perceived by CNS (Central nervous system). The stimulus is analysed and the response is sent to the effectors. Simultaneously, sympathetic nerves stimulate adrenal gland to release adrenaline which regulates blood pressure, increases heartbeat, constricts blood vessels and dilates pupil, etc. So, both nervous and endocrine systems interact and overcome the crisis together.

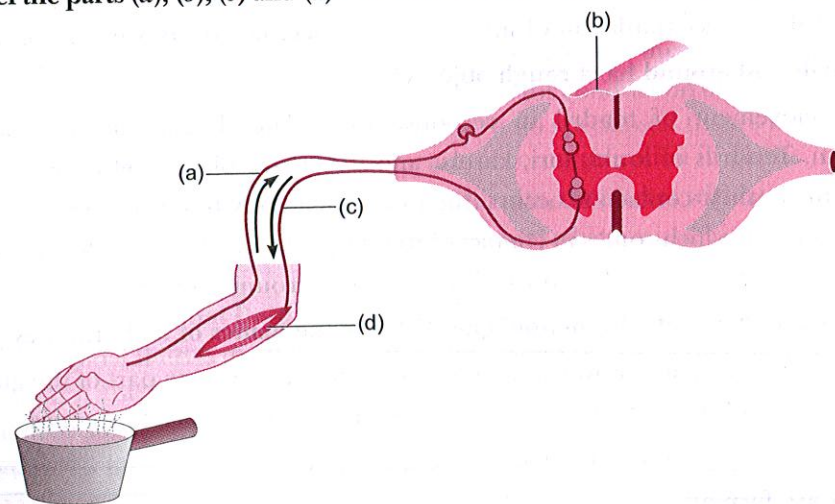
**Q. 10. How are the brain and spinal cord protected?**

**Ans. (i) Brain:** It is protected by the bony box called cranium. It is also called as skull.

Also the membranes that surround the brain (meninges) are filled with cerebrospinal fluid that act as shock absorbers protecting the brain.

**(ii) Spinal cord:** The vertebral column, commonly called backbone, protects the spinal cord.

**Q. 11. Label the parts (a), (b), (c) and (d) and show the direction of flow of electrical signals in the figure. [NCERT Exemplar]**



**Ans. (a)** Sensory neuron

**(b)** Spinal cord (CNS)

**(c)** Motor neuron

**(d)** Effector—muscle in arm

Flow of electrical signals: Receptors in hand  $\Rightarrow$  Sensory neurons  $\Rightarrow$  Spinal cord (CNS)  $\Rightarrow$  Motor neurons  $\Rightarrow$  Effector – muscles in arm.

**Q. 12. Name those parts of the flower which serve the same function as the following do in the animals:**

- (i) Testis (ii) Ovary (iii) Eggs (iv) Sperms

**Ans.**

S. No.	In case of animal	In case of flower
(i)	Testis	Anther/stamen/androecium
(ii)	Ovary	Ovary
(iii)	Eggs	Ovules
(iv)	Sperms	Pollen grains

## LONG ANSWER QUESTIONS

[5 marks]

**Q. 1. Differentiate between tropic and nastic movements in plants.**

**Ans.**

Tropic Movements	Nastic Movements
1. It can be easily observed in stems and roots.	1. It is clearly observed in bilaterally symmetrical organs such as leaves and petals of flowers.
2. It is due to unilateral stimulus which causes unequal growth on the two sides of a stem, root and tendril.	2. The movements occur due to stimulus of light and temperature.
3. Movement is related to stimulus, i.e., plant organs either move towards source of stimulus or away from it. Stimuli which causes movements in plants are gravity, light, touch, water and chemical substances.	3. Opening and closing of flowers of evening primrose and tobacco at the night and day respectively. This is due to unequal growth.
4. Example: Bending of root towards gravity and shoot towards light.	4. Example: Leaves of 'touch-me-not' plant bend and droop on touching.

**Q. 2. (i) What are cranial and spinal nerves? Describe a spinal nerve.**

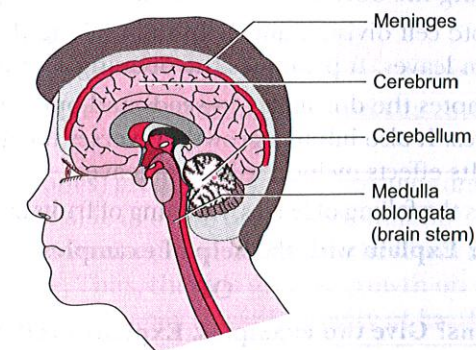
**(ii) Draw a diagram of the human brain and label the following parts:**

**(a) Cerebrum (b) Meninges (c) Medulla oblongata (d) Cerebellum**

**Ans. (i) Cranial nerves** are the nerves associated with the brain. These are 12 pairs in number and carries both sensory and motor nerves.

**Spinal nerves** are the nerves connected with the spinal cord. These are 31 pairs in number. Spinal nerve arises in the form of dorsal root and ventral root and both unite in the neural canal to form a single branch. It comes out of the vertebral column through intervertebral canal and then divides into dorsal, ventral and visceral branches.

**(ii)**



**Structure of Human Brain**

**Q. 3. Which hormone is released into the blood when its sugar level rises? Name the organ which produces the hormone and describe its effect on blood sugar level. Also name one digestive enzyme that this organ secretes and the function of this enzyme.**

**Ans.** Insulin hormone is released into the blood when its sugar level rises. Pancreas secretes the insulin hormone. The function of insulin hormone is to lower the blood sugar level. Deficiency

of insulin hormone in the body causes a disease known as diabetes. Diabetes is characterised by large quantities of sugar in the blood. The insulin hormone controls the metabolism of sugar. If due to some reason pancreas does not produce and secrete sufficient amount of insulin into blood, then the sugar level in the blood rises. The high sugar level in the blood can cause many harmful effects to the body of person. The person having severe diabetes are treated by giving injection of insulin.

The pancreas secretes pancreatic juice which contains enzymes like trypsin for digesting proteins, lipase for breakdown of emulsified fats and amylase for breakdown of starch.

**Q. 4. Describe the central nervous system in human beings.**

**Ans.** The central nervous system in human beings consists of brain and spinal cord.

(i) **Brain:** Brain is the highest coordinating centre in the body. It is covered by meninges, which is made up of three layers. It is protected by cranium. Brain is broadly divided into:

(a) **Forebrain:** The forebrain includes cerebrum and olfactory lobes. Cerebrum is the largest part of the brain. It consists of two cerebral hemispheres. Sensory and motor receptors are present in the brain. There are various regions for reception of vision (occipital lobe), reception of sound (temporal lobe), touch, smell, temperature (parietal lobe) and muscular activities (frontal lobe). Olfactory lobes are one in pair and receives olfactory nerves.

(b) **Midbrain:** It is the small portion of the brain that connects cerebrum with the other parts of the brain and spinal cord.

(c) **Hindbrain:** It consists of cerebellum, pons and medulla oblongata. Cerebellum is responsible for coordination and adjustment of movement and posture. Pons regulate respiration. Medulla oblongata regulates swallowing, coughing, sneezing and vomiting.

(ii) **Spinal cord:** Medulla oblongata extends downwards, enclosed in vertebral column to form a cylindrical structure known as spinal cord. It is also covered by meninges. It is the reflex centre of the body.

**Q. 5. Give the various functions performed by the plant hormones.**

OR

**Name various plant hormones. Also give their physiological effects on plant growth and development.** [NCERT Exemplar]

**Ans.** The various functions performed by the plant hormones are:

- Auxins promote cell enlargement and cell differentiation. They also promote growth.
- Gibberellins promote cell enlargement and cell differentiation in the presence of auxin. It also help in breaking the dormancy in seeds and buds. It promote the growth in fruits.
- Cytokinins promote cell division and help in breaking the dormancy of seeds and buds. It delay the ageing in leaves. It promotes the opening of stomata and also fruit growth.
- Abscisic acid promotes the dormancy in seeds and buds. It promotes the closing of stomata and falling of leaves. It also inhibits growth, reverses the growth promoting effects of auxins and gibberellins. Its effects include wilting of leaves.
- Ethylene promotes the falling of leaves, ripening of fruits and helps in breaking bud dormancy.

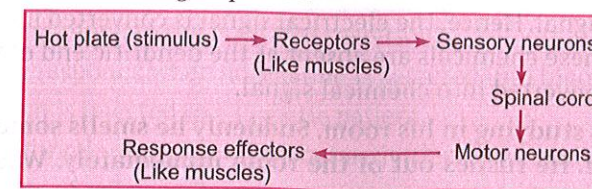
**Q. 6. What is reflex action? Explain with the help of examples.**

OR

**What are reflex actions? Give two examples. Explain a reflex arc.** [NCERT Exemplar]

**Ans.** A reflex action is defined as a spontaneous, automatic and mechanical response to a stimuli without the will of an individual. In such actions there is no involvement of the brain. All reflex actions are conveyed through the spinal cord by a path called reflex arc.

The reflex action travels in the following sequence:



The reflex arc constitutes the following components:

- A receptor to perceive the stimulus.
- A sensory or afferent nerve which carries the message from the receptor to the spinal cord.
- The neurons of spinal cord transmit the impulse from afferent neurons to efferent neurons.
- The motor or efferent nerve carries messages from spinal cord to the muscles (effectors) that show the response.

**Some examples of reflex actions are:**

- Blinking of eyes when a foreign particle gets in them.
- Sneezing if an unwanted particle enters the nose.
- Watering of mouth at the sight or smell of good food.
- Withdrawal of foot if a nail comes in the way while walking and pricks the foot.
- Immediate withdrawal of hand on touching some hot thing.

**Q. 7. With the help of an activity demonstrate geotropism in plants.**

**Ans.** 1. Soak some seeds of gram or *moong* in water for one day.

2. Pierce slightly big holes (2 mm diameter) at the bottom of the cup.

3. Fill it with 1cm thick layer of garden soil.

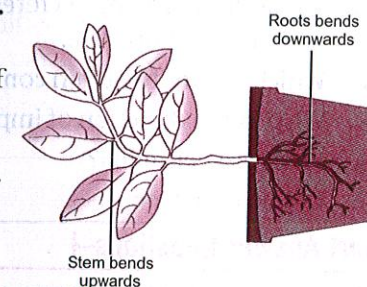
4. Sprinkle soaked seeds (*moong*/gram) over the soil. Water the seeds.

5. Put the cup on 2 pieces of wooden or stone slabs so that there is a little gap between the top of the table and bottom of the cup.

6. Cover the lower part of the set-up with black paper.

7. Water the seeds regularly with little water.

8. You will observe that the roots come out from the holes and grow towards the Earth showing positive geotropism.



## HOTS (Higher Order Thinking Skills)

**Q. 1. Why do stem and root move (grow) towards light and the centre of gravity of the Earth respectively?**

**Ans.** It is due to auxins (plant hormones) produced by the shoot apex and root tip. In stem, growth is more on the shaded side (lower side of apex) due to accumulation of auxins. In root, growth is more on the illuminated side as auxins accumulated on the lower side (shaded side) of root tip inhibits the growth of that side. Thus, there is greater growth on the upper side (illuminated side), resulting in the growth of root apex towards gravity of Earth.

**Q. 2. What is association neuron?**

**Ans.** It is found in the cortex part of spinal cord in between the sensory neuron and motor neuron. It forms synapse with the axon of sensory neuron and dendrites of motor neuron.

**Q. 3. Why is the flow of signals in a synapse from axonal end of one neuron to dendritic end of another neuron but not the reverse?** [NCERT Exemplar]

**Ans.** When an electrical signal reaches the axonal end of a neuron, it releases a chemical substance.

This chemical diffuses towards the dendrite end of next neuron where it generates an electrical impulse or signal. Hence, the electrical signal is converted into a chemical signal at the axonal end. Since these chemicals are absent at the dendritic end of the neuron, the electrical signal cannot be converted into chemical signal.

**Q. 4. Sameer was studying in his room. Suddenly he smells something burning and sees smoke in the room. He rushes out of the room immediately. Was Sameer's action voluntary or involuntary? Why?**

**Ans.** Sameer's action was voluntary because rushing out of the room was under his conscious control. The smoke and smell were perceived by the receptors in the sense organs and signals are sent to the brain. The brain, then sent signals to the effector organs, i.e., the muscles, to move out of the room.

## Proficiency Exercise

### Very Short Answer Questions

[1 mark]

- State the main function of abscisic acid in plants.
- Name the plant hormone responsible for the promotion of cell division and a hormone responsible for elongation of cells.
- Name the hormone secreted by one endocrine gland during emergency. Name the gland which secretes this hormone.
- Which part of the brain controls posture and balance of the body?
- What is the direction of impulse in a neuron?
- What are neuroglia?
- Define reflex arc.

### Short Answer Questions-I

[2 marks]

- Name the plant hormones responsible for the following:
  - Elongation of cells
  - Growth of stem
  - Promotion of cell division
  - Falling of senescent leaves
- State the role of the brain in reflex action.
- If iodine is insufficient in one's diet, what might be the deficiency disease and its symptoms?
- How does our body maintain blood sugar level?
- What happens at the synapse between two neurons?
- Match the terms of Column (A) with those of Column (B)

[NCERT Exemplar]

[NCERT Exemplar]

[NCERT Exemplar]

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

### Short Answer Questions-II

[3 marks]

- How does feedback mechanism regulate the hormone secretion?
- Explain how the human body responds when adrenaline is secreted into blood.
- Name the hormone which is injected to a diabetic patient.
  - If the cerebellum is not functioning properly, what activities of our body are affected?
- What are the components of reflex arc?
  - How do muscle cells move?
- What constitutes the central and peripheral nervous systems? How are the components of central nervous system protected?

[NCERT Exemplar]

### Long Answer Questions

[5 marks]

- What is turgor movement? Explain it with example.
- What is autonomic nervous system? State functions of sympathetic and para sympathetic systems.
- What is (i) phototropism and (ii) geotropism? With labelled diagrams describe an activity to show that light and gravity change the direction that plant parts grow in.
  - Mention the role of each of the following plant hormones: (i) Auxin, (ii) Abscisic acid
- Mention one function for each of these hormones:
  - Thyroxine, (b) Adrenaline, (c) Insulin, (d) Growth hormone, (e) Testosterone
- What are the major parts of the brain? Mention the functions of different parts.

[NCERT Exemplar]

[NCERT Exemplar]

