

2

CONTROL AND COORDINATION

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2.1 INTRODUCTION

All living organisms are exposed to variety of stimulus or environmental factors. The response to be made, depends on the event triggering it. Each stimuli is followed by only one correct response. Hence there is need of system of control and co-ordination in living organisms.

The linking together of various activities in the living organism is known as **coordination**. The process of co-ordination must be carefully **controlled**.

Two controlling mechanisms of multicellular organisms are:

- (a) **Neural control** brought about by nervous system.
- (b) **Chemical control** achieved with the help of hormones.

Animals possess both neural and chemical control while plants have only chemical control.

2.2 ANIMALS NERVOUS SYSTEM AND SENSE ORGANS

Nervous System in Animals

In animals, control and co-ordination is achieved with the help of nervous and muscular tissues. Nervous system is made up of specialized cells called **neurons**.

Structure of neuron

A neuron (nerve cell) consists of:

- (a) **Cell body / Cyton / Soma**

Cyton or cell body has a central nucleus and surrounding cytoplasm. Around the nucleus there are granules called **Nissles granules**, which are made up of R.N.A and Protein (exact function unknown, they are believed to convert impulse into electrical form).

It transfer impulse to axon.

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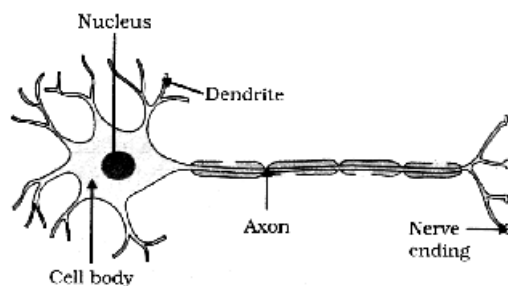
(b) Two types of processes namely dendrites and axon.

Dendrites: These are hair like processes connected to the Cyton through dendrone. They receive sensation or stimulus, which may be physical, chemical, mechanical or electrical. The information received at dendrite tip sets up a chemical reaction that creates an electric impulse. This impulse travels from dendrite to cell body

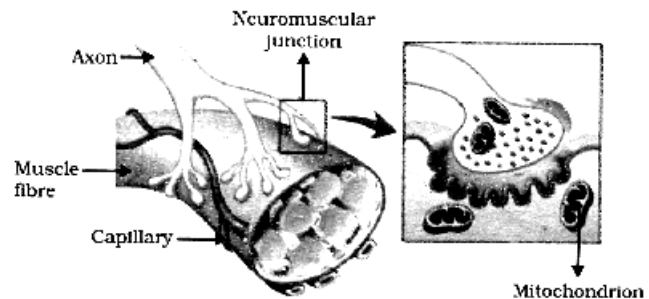
Axon- It is the longer part of the neuron. It transmits the impulse from Cyton to the tip of the axon called **axon bulb**. The plasma membrane of an axon may be covered by a sheath of lipid and protein called the **myelin sheath**. The sheath is formed by the **Schwann cells**, and is broken into constrictions called the **nodes of Ranvier**.

The ending of axon is called **synaptic terminals or nerve endings**. The impulse on reaching terminal releases some chemicals or neuro-hormones i.e. Acetyl Choline (Ach), which crosses the synapse (The physical gap between a synaptic terminal and the dendrite of another neuron or an effector cell). and transfer impulses to next neurons.

These chemicals start a similar electrical impulse in dendrite of next neuron and in same manner impulses are transmitted to effectors, such as muscles (Neuromuscular junction) and/or glands.



(a) Neuron



(b) Neuromuscular junction

Types of Nervous System in Animals

In all **vertebrates** including humans the nervous system may be divided into the **Central nervous system and peripheral nervous system**. Peripheral nervous system may be somatic or autonomous.

(A) **Central nervous system (CNS)** consisting of brain and spinal cord. There are **12 pairs of cranial** and **31 pairs of spinal** nerves in humans.

(B) **Peripheral nervous system (PNS)** consisting of cranial nerves and spinal nerves. It connects CNS to body. PNS may be somatic and autonomic as defined below:

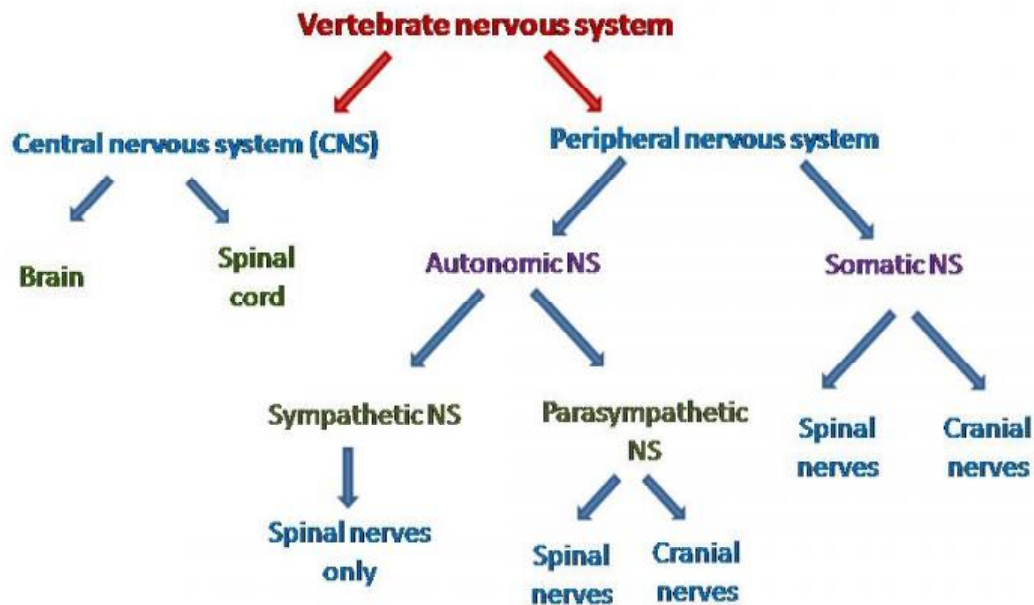
PNS that connects CNS and involuntary muscles is **Somatic** and that connects CNS to involuntary muscles is **Autonomic Nervous System (ANS)**.

Autonomic Nervous System (ANS) may be further of two types

(A) **Sympathetic:** The sympathetic division typically functions when quick responses to stimulus is require. It dialates pupil, Inhibits flow of saliva and contract bladder but acclerates heart beat.

- (B) **Parasympathetic:** The parasympathetic division functions with actions that do not require immediate reaction. It constricts pupil, increases flow of saliva, relaxes bladder but slows down heart beat. Sympathetic and parasympathetic divisions are typically antagonistic to each other. The sympathetic division works as the accelerator and the parasympathetic division works as a brake. A useful acronym to summarize the functions of the autonomous nervous system is STUDD (salivation, tear, urination, digestion and defecation).

The arrangement of the nerves of the body into vertebrate nervous system



Sense Organs / Receptors

Information from environment is gained by specialized tips of the nerve cells or receptors. These receptors are located in our sense organs like

Photoreceptors for light eg. eye.

Phonoreceptors for sound eg. ear.

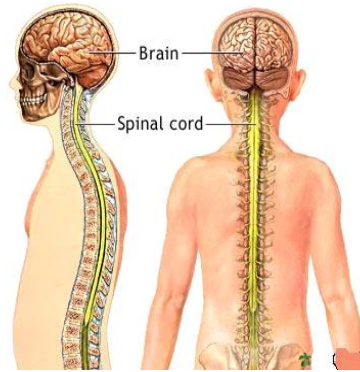
Olfactory receptors for smell eg. nose.

Gustatory receptor for taste eg. tongue.

Tactile receptor for touch eg. skin.

2.3 SPINAL CORD, REFLEX ACTION AND REFLEX ARC

The **spinal cord** is a long, thin, tubular bundle of nervous tissue. It is part of CNS mainly concerned with reflex action.



Reflex action is a spontaneous, automatic, mechanical response to a stimulus. It is involuntary response of effectors (glands or muscles) to stimuli, **mediated by spinal cord**.

Thinking is a complex activity which involves a complicated interaction of many nerve impulses from many neurons. This interaction requires time. In case of urgent situation like touching hot plate, body needs quick system which takes immediate action to minimize damage. Such system is reflex system and it is mediated by spinal cord. **Ian Pavlov** regarded as father of reflex action.

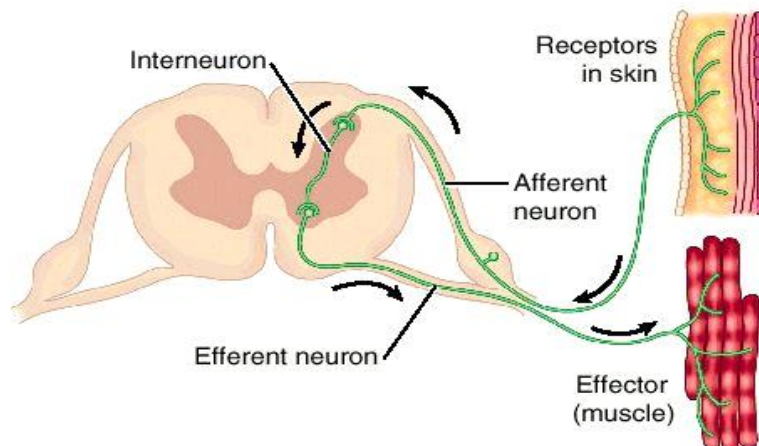
Nerve from all over the body meets in bundle in spinal cord on their way to brain. Since spinal cord is the first point where nerves meet each other, so reflex action is mediated by spinal cord. After action is complete, the information input reaches brain. Brain has no direct role in reflex action.

Examples of reflex action

- Withdrawal of hand when it touches hot object.
- Knee jerk reflex (on tapping Patella leg move forward).
- Constriction of pupil when strong light is flashed.
- Sneezing, coughing and yawning.

Path followed by an impulse in reflex action is known as **reflex arc**. Reflex always travels in one direction in the following sequence

Stimulus → Receptor organ → Sensory nerves → spinal cord → Motor nerve → Effector organ → Response



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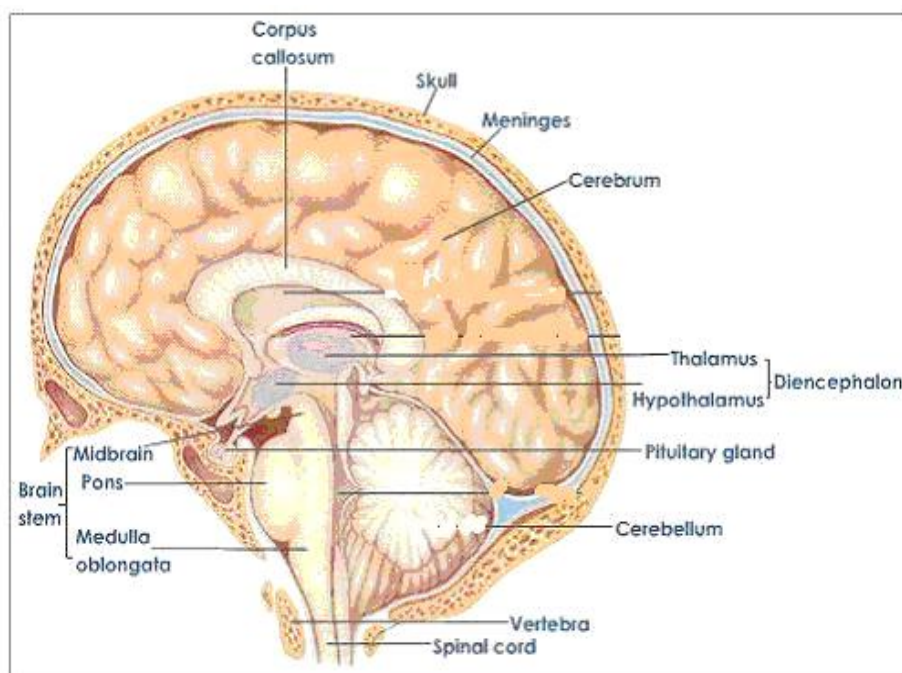
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Significance of Reflex Action

- (i) It enables the body to give quick responses to threatening stimuli and thus protects our body.
- (ii) It helps to minimize the overloading of brain.
- (iii) Thinking process of brain is not fast enough.
- (iv) Many lower groups of animals have very little or none of the complex neuron network needed for thinking. In them the reflex arcs have evolved as efficient ways of functioning in the absence of true thought processes.

2.4 HUMAN BRAIN

It is the highest coordinating centre in the body. Complex process like thinking, memory is connected to brain.



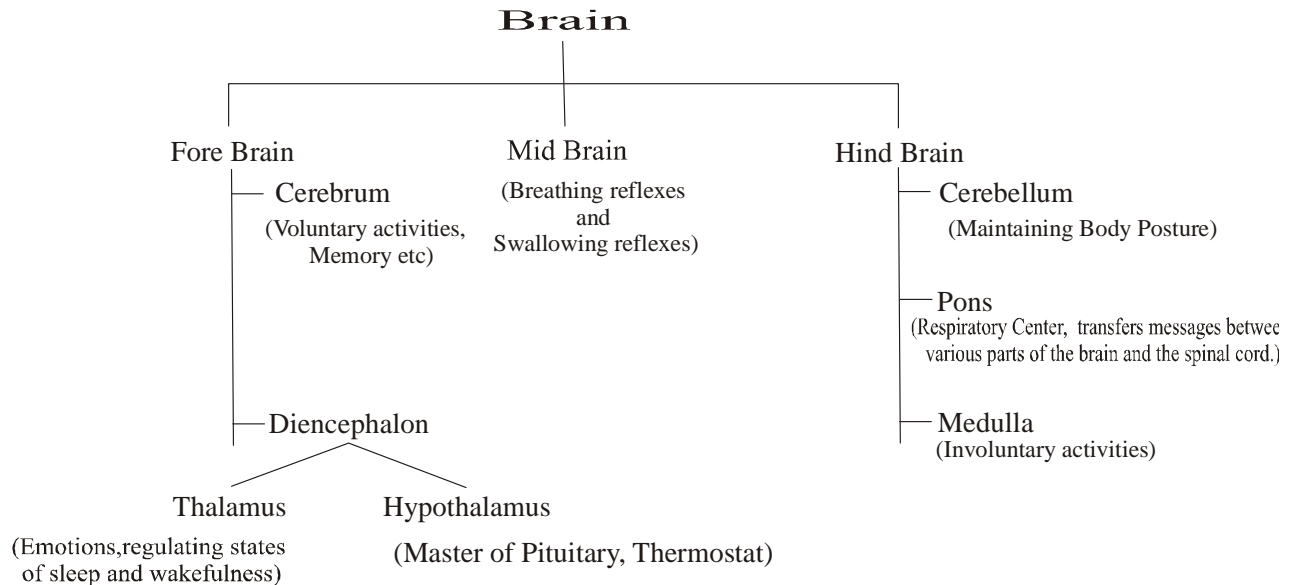
The brain is broadly divided into three regions: Fore-brain, mid-brain and hind-brain.

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- (i) **Fore-brain** includes Cerebrum, thalamus and hypothalamus (Diencephalon)

Cerebrum

The cerebrum or cerebral cortex is the largest part of the human brain, associated with higher brain function such as thought and action. The cerebral cortex is divided into four sections, called “lobes”: the frontal lobe, parietal lobe, occipital lobe, and temporal lobe.

- (a) Occipital lobe is the regions for sight, i.e., visual reception.
- (b) Temporal lobe is the region for hearing, i.e. auditory reception.
- (c) Frontal lobe is the region for speech, facial muscular activities and higher mental activities.
- (d) Parietal lobe is the region for taste, smell, touch and conscious association.

The cerebrum has **sensory areas** where information is received from the sense organs called receptors. Similarly, cerebrum has **motor areas** from where instructions are sent to the various muscles of the body called effectors to do the various jobs.

Areas of association are present in cerebral cortex. They are neither sensory nor motor. They receives information from sensory areas and it is involved in “higher” functions such as perception, thoughts and decision-making, etc.

Thalamus is essentially a relay station that takes in sensory information and then passes it on to the cerebral cortex. It is related to emotions and controlling state of wakefulness and sleep.

Hypothalamus: It is master of master endocrine gland which is mainly responsible for maintaining body temperature (**Thermostat**). It also regulates desires, Food and Water Intake, Sleep & Wake Cycle etc.

- (ii) **Mid-brain-** It connects the fore-brain to hind-brain. It controls reflex movement of the head, neck and trunk in response to visual and auditory stimuli. It is also related to audio and visual response.
- (iii) **Hind-brain-** It consists of three centers called Cerebellum, Pons and Medulla oblongata.
Cerebellum lies at the roof of the hind-brain. This region controls the coordination of body movements and posture. It is **second largest** part of brain.
Pons lies just above the medulla and take part in regulating respiration.
Medulla oblongata lies at the floor of the hind-brain and continues into the spinal cord. It is also the regulating centre for swallowing, coughing, sneezing and vomiting. Medulla contains respiratory center. Thus, pons and medulla both regulate involuntary activities of body.

Protection of Central Nervous System (Brain and Spinal Cord)

Owing to function and importance of Central Nervous System it is well protected inside the body.

Brain is protected inside brain box or cranium.

Brain is covered by layers known as meninges (Outer Dura-mater, Arachnoid, and Pia-mater)

Spinal cord is protected by Vertebral column & meninges.

How does the Nervous Tissue cause Action on Effector (Muscles).

The nervous tissue collects information from receptors and sends it to the brain (CNS), brain processes information and makes decision. Decision is conveyed to muscles for action.

When a nerve impulse reaches the muscles, the muscle fibers move by changing the shape of the muscle cells with the help of special proteins (actin and myosin). This process require certain chemical messenger (Neuro-hormones) to transmit impulses to muscles and also ATP and Ca^{++} ions.

Impulse is transmitted in electrochemical form.

The overall pathway is:

Nervous tissue → Collect information → Transfer information → Brain Process information → Interpretation → Action (By muscle & glands)

Try yourself

- Olfactory reception is related to sense of
 (A) Smelling (B) Tasting (C) Hearing (D) Vision
- Axon are
 (A) Impulse (B) Cytoplasmic extension (C) Part of muscles (D) All are correct
- Receptor for stimulus are present in
 (A) Stomach (B) Response (C) Sense organ (D) Hot objects
- Impulse is generated when
 (A) Response is over (B) Response is going to be over
 (C) Stimulus is gained (D) Stimulus is over
- CNS consists of
 (A) Brain (B) Spinal Cord (C) Both (A) and (B) (D) None of these

6. Which among them is not a voluntary action of body
 (A) Writing (B) Talking (C) Walking (D) Breathing
7. Cranium is related to
 (A) Head (B) Thorax (C) Abdomen (D) Limbs

2.5 COORDINATION IN PLANTS

Plants respond to light, touch, gravitational force and other stimulus. Plant lacks nervous system and muscles so they rely on chemical or hormonal control. The growth in plants is controlled by plant hormones or **Phytohormone**.

Stimulus and Response: Stimulus is the change in the external or internal environment of an organism that provokes a physiological and behavioral change in the organism. The changes thus caused are termed as **response**.

Type of Plant Movements

Plants show two types of movement- one dependent on growth and other independent of growth

Plant Movement	
Nastic	Tropic
Rapid response to non directional stimuli (eg temperature)	Slow response to directional stimuli.
It is reversible as independent of growth	Related to growth so irreversible
eg. Movement in <i>Mimosa pudica</i> on touching (thigmonastic)	eg. Bending of shoot towards light (phototropic)

Plant Movements: The movements of the individual plant part or organ of a plant like shoot, root, etc., are due to some external stimuli like light, force of gravity, chemical substances, water, etc.

Non-directional or Nastic movement:

Movement in *Mimosa pudica* (touch me not plant)

It is **Thigmo-nastic movement** (Thigmo = touch, Nastic = non directional), growth independent.

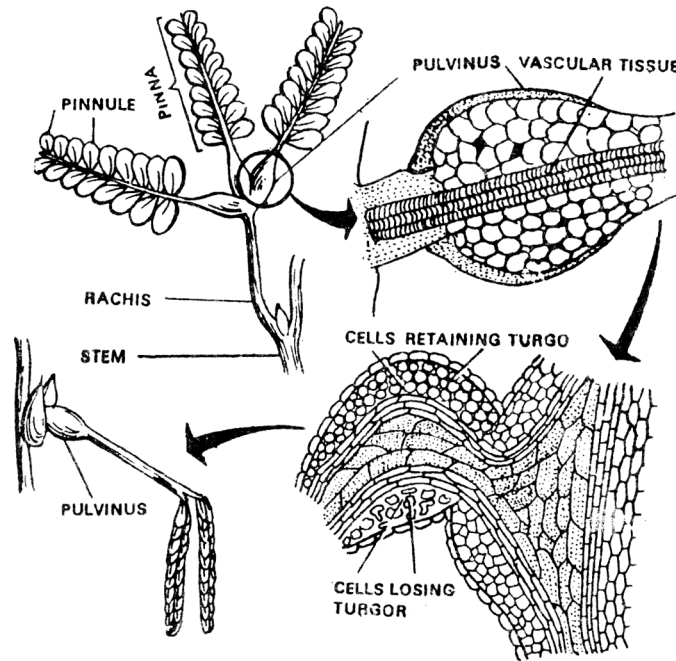
Plants use **electrochemical** means to convey information from cell to cell (No specialized nervous tissue in plants).

Sensitive plants shows response very quickly in response to touch that are independent of the direction of the stimuli.

The plant respond by changing shape of cells (No muscle protein in plants).

The plant cells **changes shape by changing the amount of water** in them in response to stimuli resulting in swelling or shrinking of cells.

In ***Mimosa pudica*** the lower side of pulvinus has large cells that are loosely packed while upper side has small cells that are tightly packed. On receiving stimuli, the lower cells release water and become flaccid. As a result leaves drops down. With time lapse, water moves back into lower cells making them turgid and leaves are again up right or comes to its original position.



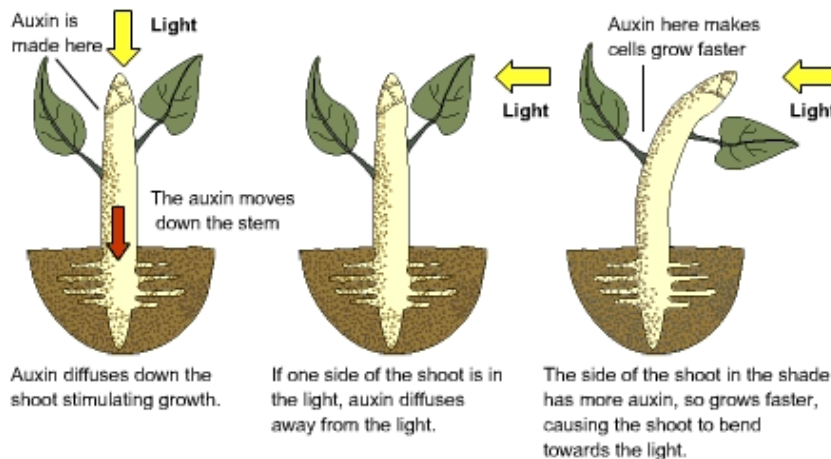
Demonstration of seismonastic movement in *Mimosa pudica*.

Directional or Tropic Movement: It is the directional growth or movement of plant organ in response to an external stimulus. Thus, growth dependent movement.

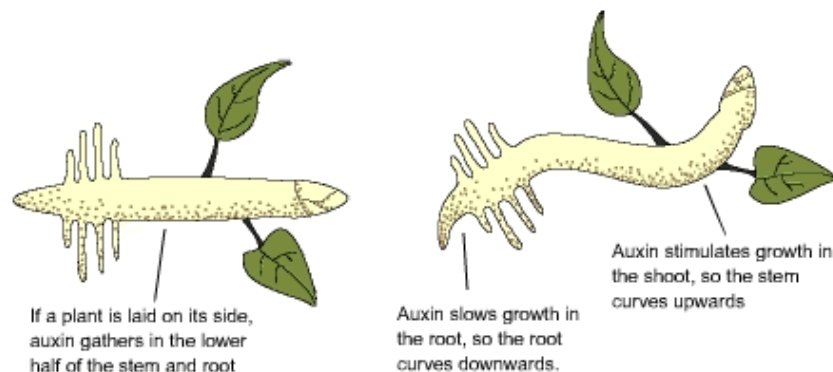
Growth towards the stimulus is positive tropism and growth away from the stimulus is negative tropism.

Tropic movements are classified as follows, depending on the type of stimulus causing it:

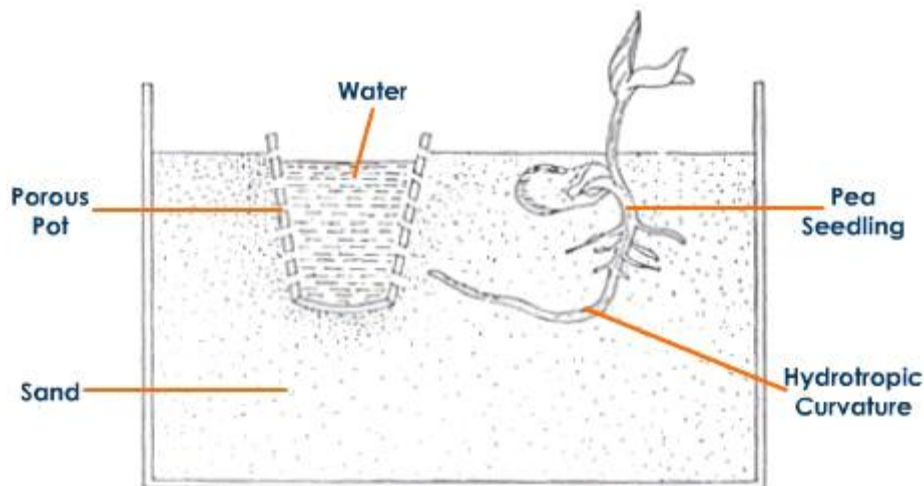
- (i) **Phototropism** is the movement of part of the plant in response to light. The main factor responsible for it is differential movement of Auxin concentration towards shade area when unidirectional light is provided. So, the part which is in shade grows more and particular part of plant tilt towards source of light.



- (ii) **Geotropism** is the upward growth of shoots (Negative) and downward growth in roots (Positive) in response to the pull of earth or gravity. It is due to accumulation of Auxin in lower half.



- (iii) **Hydrotropism** is the movement of a part of the plant in response to water. It is stronger as compared to geotropism as shown in underlying figure that root denies gravity to ensure water availability.



- (iv) **Chemotropism** is the movement of a part of the plant in response to a chemical stimulus. If the plant part shows movement or growth towards the chemical, it is called positive chemotropism and if the plant part shows movement or growth away from the chemical, it is called negative chemotropism. **For example**, the growth the pollen tube towards a chemical which is produced by cells of ovule during the process of fertilization in a flower.

2.6 PLANT HORMONE

- **Plant Hormones or Phytohormone** can be defined as a chemical substances which is produced naturally in plants and are capable of translocation and regulating one or more physiological processes when present in low concentration.

- Plant hormones help to coordinate growth, development and responses to the environment.
- They are synthesized at places away from where they act and simply diffuse to the area of action.

Type of Phytohormone The major types of plant hormones which are involved in the control and coordination in plants are as follows:

(1) Auxins : Indole Acetic Acid (IAA) is major Auxin in plants. Important function:

- (i) Responsible for tropic movement. Plants bend towards sunlight (Positive Phototropism).
- (ii) Helps in increasing length of plant as it is synthesized at the tip of root and shoot. Cell elongation is the primary and chief function of auxin in plants, by removing tips we can make plant bushy. As apical bud suppress growth of lateral buds in plants. It is called **apical dominance**.
- (iii) It induces parthenocarpy to obtain seedless fruits for eg. in orange, apple, tomato, banana etc.
- (iv) Prevent falling of unripen fruits.
- (v) Helps in removal of weeds for eg. 2, 4D.

(2) Gibberellins:

- (i) It stimulates the elongation of stem particularly **at the internode region**.
- (ii) It induces germination of dormant seeds.
- (iii) Helps in removing genetic dwarfism.
- (iv) Helps of flowering and development of fruits.

(3) Cytokinins

- (i) These compounds are synthesized in the seeds and the roots of the plants.
- (ii) It promotes cell division by activating DNA synthesis and protein synthesis.
- (iii) They are present in large concentration in areas of rapid cell division (such as fruits and seeds).
- (iv) Break dormancy.
- (v) Delaying of senescence.

(4) Abscisic acid (ABA)

- (i) Commonly known as **stress hormone** because the production of hormone is stimulated by drought, water logging and other adverse environmental conditions.
- (ii) It reverses the promotory effects of Auxins and gibberellins.
- (iii) **Abscisic acid** is primarily a **growth Inhibitor** responsible for wilting of leaves. It is found in leaves, dormant seeds, buds and other parts of the plant.
- (iv) ABA promotes abscission of leaves, flowers and fruits.
- (v) It also promotes the **senescence of leaves**.
- (vi) Helps in reducing transpiration rates by closing stomata.

(5) Ethylene

- (i) Ethylene is a **gaseous plant hormone** which stimulates transverse growth but retards the longitudinal one.

- (ii) It is formed in almost all plants parts – roots, leaves, flowers and seeds.
- (iii) **Ethylene promotes** fruit growth and its ripening.
- (iv) Normally reduces flowering in plants except pineapple.

Try yourself

8. Response in plant are regulated by
(A) Sunlight (B) Gravity (C) Air (D) Phytohormone
9. Animals have specialized protein that helps in movement. Plant show movement due to change in
(A) nature of plasma membrane (B) amount of water
(C) amount of enzyme (D) none of these
10. Movement of pollen tubes towards ovule is an example of
(A) Geotropism (B) Hydrotropism (C) Chemotropism (D) Phototropic
11. Unlike tropisms, nastic movements are in response to
(A) Darkness (B) Wind
(C) Non-directional stimuli (D) Directional stimuli
12. Roots grow downward as a _____ response.
(A) Positive phototropic (B) Negative phototropic (C) Negative geotropic (D) All of these
13. Ripening of fruits, such as bananas, is hastened by
(A) Gibberellins (B) Abscisic acid (C) Cytokinin (D) Ethylene

Chemical Messengers

Hormones are the chemical substances which coordinate and control the activities of living organisms and also their growth. The term hormone was introduced by **Bayliss** and **Starling**. Hormones are chemically made up proteins or lipids.

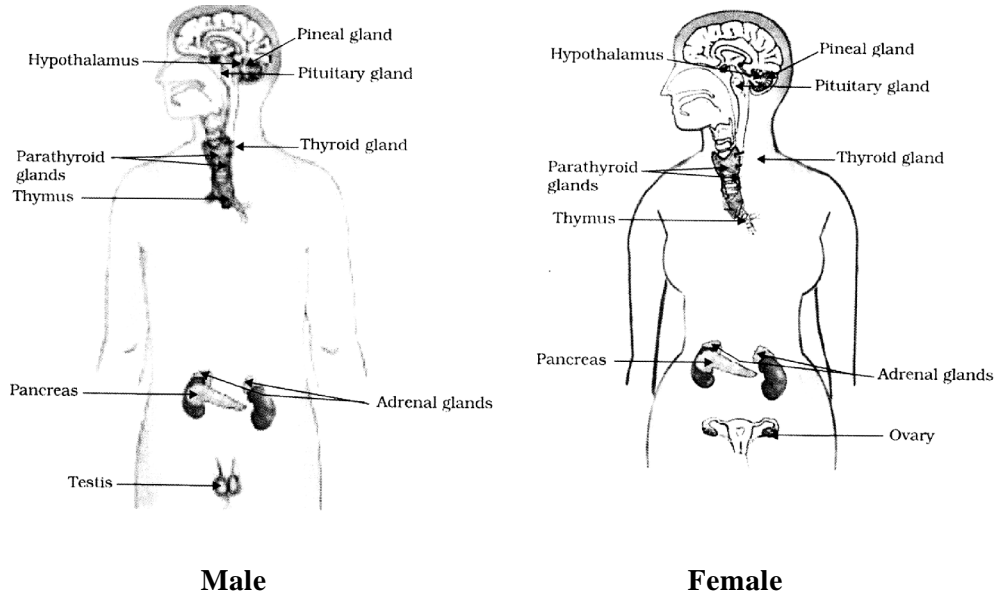
Characteristics and Functions of Hormones

- (i) Hormones are the secretions of endocrine (ductless) glands or tissues.
- (ii) They are poured directly into the blood and carried through out the body by blood circulatory system.
- (iii) Hormones have their effect at the sites different from the sites where they are made. So, they are also called ‘chemical messengers’.
- (iv) They act on specific tissues or organs called ‘target organs’ or ‘target site’.
- (v) They coordinate the activities of the body and also its growth.
- (vi) They are secreted in extremely minute quantities.

2.7 HORMONES IN ANIMALS

Hormones are the means of information transmission in animals along with the neural control. Animal hormones are a part of the endocrine system, which constitutes a second way of control and coordination in their body.

Endocrine glands: These are the structures or group of cells or tissue which manufacture hormones and secrete them directly into the bloodstream to act at distant sites in the body known as target organs or cells. They lack ducts and pour their secretion in blood. Thus, also known as ductless glands. The following are the major endocrine glands in human body:



Hypothalamus, pituitary (hypophysis), pineal, thyroid, parathyroid, pancreas, adrenal, testes (in males) and ovaries (in females).

Some endocrine glands like pancreas, testis and ovary are, both exocrine and endocrine in functions. So, these are called **mixed glands** or **heterocrine glands**.

(i) **Hypothalamus**

- It is present in the fore brain.
- It regulates the secretion of hormones from pituitary gland and it produce releasing hormones, so it is also known as ‘Master of master endocrine gland’. **Hypothalamus also secretes ADH (vasopressin) and Oxytocin (Birth Hormone)**.
- Vasopressin hormone regulates water and electrolyte balance in the body. Its deficiency causes **diabetes insipidus**.
- Oxytocin hormone regulates the ejection of milk during lactation. It is also known as **birth hormone** as it cause contraction of smooth muscles of uterus during child birth.

(ii) **Pituitary glands (Hypophysis)**

- It is present at the base of the fore brain. It is also known as the **master endocrine** gland as it controls the all other endocrine glands of the body. The pituitary gland mainly secretes following hormones:
- **Growth Hormone (GH)** regulates the growth and development of bones and muscles. Excess secretion of GH cause ‘gigantism’ while less secretion causes ‘dwarfism’.
- **Trophic hormones** regulate the secretion of hormones from other endocrine glands like adrenal glands, thyroid gland, testes and ovaries.
- **Prolactin hormone** regulates the function of mammary glands in females.

(iii) Pineal gland

- It is present in the brain near to the pituitary gland.
- It secretes melatonin hormone which delays sexual development and induce sleep.

(iv) Thyroid gland

- It is present in the neck on either side of trachea. It consist of two lobes joined by isthmus. It produce **thyroxine**.
- Regulate BMR or Basal Metabollic Rates in body.
- Iodine is necessary for the thyroid gland to make thyroxin hormone, so lack of Iodine cause swelling in thyroid gland (**Goiter**).
- Soil of hilly areas is deficit of iodine. So, hilly areas are regarded as **goiter belt**.
- Thyroxin regulates the metabolism of carbohydrates, fats and proteins in the body so as to provide the best balance for growth.
- It also regulate metamorphosis in tadpole larvae of frogs.

(v) Parathyroid glands

- These are four in number, which are embedded in the thyroid gland.
- They secrete a hormone called **calcitonin** or **parathormone**, which regulates calcium and phosphate levels in the blood (moves calcium from bones to blood). Hence, increases calcium level in blood.

(vi) Thymus

- It is paired structure present in chest.
- It secretes the hormone **thymosin** which activates immune responses and helps in the production of antibodies.
- This gland degenerates after sexual maturity is attained.

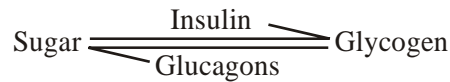
(vi) Adrenal glands

- These are two in numbers, which are located one on top of each kidney. So also called **supra-renal gland**.
- Internally it consists of two parts **outer cortex** and **inner medulla** which secretes **corticoids** and **adrenaline** hormone respectively.
- Corticoide hormones regulate carbohydrate metabolism, mineral balance and sexual development in the body.
- Adrenaline hormone is secreted in emergency or stress condition and regulate heart beat, breathing rate, blood pressure etc. in the body. It works on the principle of flight, fright and fight. So the gland also known as **3F gland**.
- This gland is related with sex, sugar, salt, stress, so also called as **4S gland**.

(vii) Pancreas

- It is present just below the stomach in between both limbs of duodenum in the body.
- Pancreas is mixed gland (exocrine as well as endocrine gland). The endocrine part is called the **islets of langerhans**.

- It secretes two hormones-**insulin and glucagons**.
- The function of insulin hormones is to lower the blood glucose as it converts sugar into glycogen.
- The function of glucagons hormone is to increase the blood glucose as it converts glycogen into sugar.



(viii) Testes

- In males, testes are present outside the abdomen cavity in scrotum. It produces male hormone and male gametes.
- They secrete male sex hormone called **testosterone**.
- The function of testosterone hormone is to regulate development of male accessory sex organs and secondary sexual characters of male like moustache, beard and voice.

(ix) Ovaries

- In female, ovaries are present in the lower abdomen. It perform dual function of producing female gametes as well as female sex hormone.
- They secrete two female sex hormones called **estrogen and progesterone**.
- The function of estrogen hormone is to regulate the development of female accessory sex organs and secondary sexual characters of female such as mammary glands, soft skin, hair pattern and feminine voice.
- The function of progesterone hormone is to control the uterus changes in menstrual cycle. It also helps in the maintenance of pregnancy.

2.8 HOMEOSTASIS AND FEED BACK

Homeostasis is the maintenance of steady state inside organism irrespective of changes in the environment. Hormones maintain homeostasis by their integrated action and feed back control.

Example: – Hormone thyroxin regulates the rate of chemical activities of the cells or regulate BMR of the body. It is produced by thyroid gland and is passed into blood.

Thyroxin is produced under the influence of **thyroid stimulating hormone (TSH)** produced by anterior pituitary gland. Anterior Pituitary in turn is stimulated by **thyrotrophic releasing hormone (TRH)** produced by the hypothalamus. The level of thyroxin is guard by hypothalamus. If the level of thyroxine is higher in blood it gives **negative feed back** to the hypothalamus. Which stops forming TRH which stops production of TSH by pituitary. No thyroxine is secreted by Thyroid untill it level becomes normal.

When level of thyroxine is lower in blood, **positive feed back** is given to hypothalamus. Hypothalamus starts forming more thyrotrophic releasing hormones, which stimulates the production of TSH by the pituitary. So, now thyroid is stimulated by TSH to produce more thyroxin in blood untill its level become normal in blood.

EXERCISE-I

[1 Marks Each]

1. Name the two mechanisms which control and coordinate the activities of the different parts of the body.
2. Name the master gland of the body.
3. Name the hormone which stimulates growth of milk glands and milk secretion.
4. Name the largest endocrine gland.
5. Name the hormones produced by Pancreas.
6. Name the disease, which is caused due to deficiency of insulin.
7. Write the full form of : (a) PNS (b) CNS (c) TSH (d) TRH
8. Mention the three layers of meninges from outside to inside.
9. Name the part of brain which controls equilibrium and posture of body.
10. Name the part of hind brain which takes part in regulation of respiration.
11. We suddenly withdraw our hand when a pin pricks. Name the type of response involved in this action.
12. Which hormone is responsible for the development of moustache and beard in men?
13. Give four functions of plant hormones.

[Short answer question (2 Marks)]

14. Why is abscisic acid known as stress hormone?
15. Distinguish between nastic and tropic movement.
16. Explain the feedback control mechanism of hormones.
17. Name the box in which brain is situated. What is the weight of fully grown human brain?
18. Name the largest and second largest part of the brain.
19. If one fruit is ripened and if it is kept in a basket of raw fruits, then what will happen? What is the cause of it.
20. Name the four lobes of cerebrum and give its functions.
21. What are phytohormones? Name any two phytohormones.

[3 Marks]

22. What is the endocrine control in the 'fight and flight' response? Explain.
23. Nervous and hormonal system together perform the function of control and coordination in human beings. Justify the statement.
24. 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?

[5 Marks Each]

25. Name the different endocrine glands in the human body. Mention the roles they play in the human body, giving names of the hormones secreted.
26. Explain the structure of a brain with the help of a suitable diagram. Give one function each of various parts of brain.

EXERCISE-II

- The bending of shoot tip towards light is known as
(A) Geotropism (B) Phototropism (C) Chemotropism (D) Hydrotropism
- Which of the following gland is unpaired?
(A) Adrenal (B) Testis (C) Pituitary (D) Ovary
- Which of the following is commonly known as 'birth hormone'?
(A) Prolactin (B) Oxytocin (C) ADH (D) FSH
- Deficiency of Insulin causes
(A) Diabetes mellitus (B) Diabetes insipidus (C) Cretinism (D) Dwarfism
- The structural and functional unit of nervous system is
(A) Nephron (B) Neuron (C) Cyton (D) Axon
- Name the layers of brain from inside towards the outside
(A) Duramater, Arachnoid and Piamater (B) Arachnoid, Duramater and Piamater
(C) Piamater, Arachnoid and Duramater (D) Arachnoid, Piamater and Duramater
- One of the following is not a reflex action
(A) Knee Jerk (B) Boxing (C) Coughing (D) Eye lid closing

EXERCISE-III**SECTION-A**

- Fill in the blanks**
- The central nervous system consists of the _____ and _____.
 - _____ reduce blood sugar
 - _____ gland is embedded in thyroid gland.
 - _____ is synthesised at shoot tip.
 - _____ inhibit growth in plant.
 - Brain is present in _____ which is part of skull.
 - _____ functions are controlled by medulla.

SECTION-B

- Multiple choice question with one correct answers**
- Which among them is a reflex arc
(A) Sensory neuron → Motor neuron → Relay neuron
(B) Motor neuron → relay → motor neuron
(C) Sensory → relay → motor neuron
(D) Relay → Motor → Sensory
 - Hypothalamus is a part of
(A) Fore brain (B) Mid brain (C) Hind brain (D) Medulla
 - While writing on a wall, what type of muscle are used
(A) Cardice (B) Voluntary (C) Involuntary (D) Brain

4. Drooping of leaf in Mimosa plant is
 (A) due to dependence on growth (B) movement independent of growth
 (C) due to loss of turgidity (D) Both (B) & (C)
5. While touching a hot plate, a reflex action is seen what is the effector in it
 (A) Skin (B) Spinal cord (C) Muscle (D) Brain

SECTION-C

• **Multiple choice question with one or more than one correct answers**

1. Function of cerebellum is seen during
 (A) riding a bicycle (B) sitting on a chair (C) walking on a rope (D) sneezing
2. Skeletal system protect
 (A) Brain (B) Spinal cord (C) Lungs (D) Bone
3. Environmental triggers that change the direction that plant parts grow in are
 (A) Light (B) Gravity (C) Phytohormones (D) Conical flask
4. Coordination in animal is due to
 (A) Light (B) Gravity (C) Nervous system (D) Endocrine system
5. Following are the plant hormone
 (A) Cytokinin (B) Gibberellins (C) Auxin (D) ABA

SECTION-D

• **Assertion & Reason**

Instructions: In the following questions as Assertion (A) is given followed by a Reason (R). Mark your responses from the following options.

- (A) Both Assertion and Reason are true and Reason is the correct explanation of 'Assertion'
 (B) Both Assertion and Reason are true and Reason is not the correct explanation of 'Assertion'
 (C) Assertion is true but Reason is false
 (D) Assertion is false but Reason is true

1. **Assertion:** A person has lost most of its intelligence, memory and judgement.
Reason: He undergoes operation of a tumour located in the cerebrum
2. **Assertion:** Transmission of the nerve impulse across a synapse is accomplished by neurotransmitter.
Reason: Transmission across a synapse usually requires neurotransmitter because there is small space i.e. synaptic cleft that separates one neuron from another.

SECTION-E

• **Match the following (one to one)**

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. Only One entries of column-I may have the matching with the same entries of column-II and one entry of column-II Only one matching with entries of column-I

- | 1. Column I | Column II |
|-----------------------------------|---------------------|
| (A) Plant growth inhibitor | (P) Effector organs |
| (B) Motor nerve | (Q) Spinal cord |
| (C) Reflex action | (R) Abscisic acid |
| (D) Plant Growth promotor Hormone | (S) Cytokinin |

SECTION-F

- **Comprehension**

Plant hormones are broadly classified as growth promoting and growth inhibiting. Auxin responsible for apical dominance, Gibbrellin responsible for increasing internodal distance and cytokinin for cell division are growth promoting while ethylene for fruit ripening and ABA is growth inhibiting.

1. Name a gaseous hormone.
2. When shrubs tips are cut they starts spreading. Name hormone which is removed in this case?
3. Which hormone is produced during stress condition?

SECTION-G

- **Match the following (one to many)**

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one entries of column-I may have the matching with the some entries of column-II and one entry of column-II may have one or more than one matching with entries of column-I

1. **Column I**

- (A) Thyroxin
- (B) Auxin
- (C) Oxytocin
- (D) Cytokinin

Column II

- (P) Plant hormone
- (Q) Animal hormone
- (R) Deficiency causes Goitre
- (S) Cell division

Answers

Try Your Self

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (A) | 2. (B) | 3. (C) | 4. (C) | 5. (C) |
| 6. (D) | 7. (A) | 8. (D) | 9. (B) | 10. (C) |
| 11. (C) | 12. (B) | 13. (D) | 14. (B) | 15. (D) |
| 16. (B) | 17. (A) | 18. (A) | 19. (B) | 20. (A) |
| 21. (B) | | | | |

Exercise II

- | | | | | |
|--------|--------|--------|--------|--------|
| 1. (B) | 2. (C) | 3. (B) | 4. (A) | 5. (B) |
| 6. (C) | 7. (B) | | | |

Exercise-III**Section-A**

- | | |
|-----------------------|------------|
| 1. Brain, spinal cord | 2. Insulin |
| 3. Parathyroid | 4. Auxin |
| 5. Abscisic acid | 6. Cranium |
| 7. Involuntary | |

Section-B

1. (C) 2. (A) 3. (B) 4. (D) 5. (C)

Section-C

1. (A,B,C) 2. (A,B,C) 3. (A,B) 4. (C,D) 5. (A,B,C,D)

Section-D

1. (A) 2. (A)

Section-E

1. (A)-(R), (B)-(P), (C)-(Q), (D)-(S)

Section-G

1. (A)-(Q,R), (B)-(P), (C)-(Q), (D)-(P,S)