Control and coordination *(CLASS 10TH BIOLOGY)*

Q. What do you mean by control and coordination?

Ans. The working together of various organs (parts) of the body of an organism in a proper manner to produce reaction to a stimulus is called coordination. For proper control and coordination, higher organisms have evolved two systems – nervous system and endocrine system. The nervous system, composed of nerves which control and coordinate the body by sending electrical signals called nerve impulses. The endocrine system, composed of endocrine glands, control and coordinate the body by sending chemical messengers called hormones. Higher multicellular animals have both nervous and chemical control and coordination, whereas plants posses only chemical coordination and lack nervous coordination. It is to be noted that nervous control is speedy but its effect is localized, where as chemical control (hormonal control) is usually slow acting but its effect is specific.

Q. What are the types of neurons?

Ans. The neurons are of three types:

(i) Sensory neurons

(ii) Motor neurons,

(iii) Inter neurons.

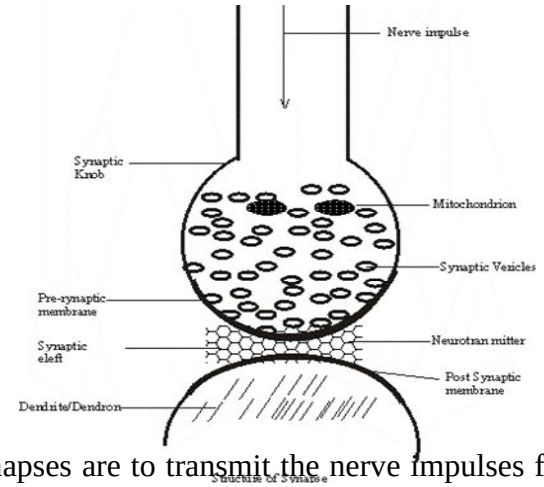
(i) Sensory neurons: The neurons which conduct impulses from the peripheral tissues to the central nervous system are called sensory neurons. These are also called afferent neurons as they carry impulses towards the CNS. Sensory neurons perceive sansations from receptors through their dendrites and dendrons attached with receptors and conduct and transmit sensations in the form of nerve impulses through successive sensory neurons towards CNS. As the nerve impulses always travel from cell body to Axons, thus sensory neurons have cell body directed towards the receptors and axons and synaptic knobs towards CNS (Brain and spinal card).

(ii) Motor neurons: The neurons which conduct impulses from the central Nerous system to the peripheral tissues (effectors) are called motor neurons. These are also called efferent neurons as they carry impulses away from the CNS. Motor neurons have their cell bodies and dendrites directed towards the CNS and, axons and synaptic knobs directed towards the effectors i.e, muscles and glands. he motor neurons at the terminal part of the motor nerve at effectors possess motor end plate which is formed by the branching of the terminal part of axon.

(iii) Inter neurons: The neurons which conduct nerve impulses between sensory neurons and motor neurons, are called inter-neurons. Thus inter-neurons connect sensory neurons with motor neurons and are also called connectors or intermediate neurons or relay neurons. These neurons are mostly present in the spinal cord and brain where they transmit impulses between sensory neuron and motor neurons and have very important role in reflex actions. Inter neurons posses some what different structure which posses cell body almost at middle between length of dendron and axon.

Q. What are synapses?

Ans. Synapses are the junctions between the two neurons, across which the nerve impulses transmit from one neuron to another one. A synapse consists of synaptic knob of one neuron and the dendrite of another neurons with a very minute gap between their two membranes called synaptic cleft which is usually filled with synaptic flnid. The membrane of the synaptic knob facing towards synaftic cleft is thickened and is called pre-synaptic membrane, and similarly the membrane of dendrite facing the synaptic cleft is thickened and is called post synaptic membrane.



The function of synapses are to transmit the nerve impulses from synaptic knobs to dendrites. When the nerve impulse reach the synaptic knob, the synaptic vesicles get stimulated to release the neuron transmitter in the synaptic cleft. The neurotransmitter molecules diffuse across the synaptic cleft to the post synaptic membrane of the dendrite and activates the other neuron. Thus the nerve impulse is transmitted from one neuron to another through synapse and the time taken by the neurotransmitter molecules to diffuse from pre-synaptic membrane to post-synaptic membrane is about 0.5ms called as synaptic delay. The nerve impulses always travel from synaptic knobs to dendrites in reverse direction.

The neurons releasing acetylcholine as neurotransmitter are termed as **cholinergic neurons**. The neurons releasing noradrenaline as neurotransmitter at synaptic knobs are termed as **adrenergic neurons.**

(Q) Discuss nervous system of man?

Ans) The nervous system of man is divisible into three main parts.

(1) Central nervous system (2) Peripheral nervous system (3) Autonomic nervous system

(1) Central nervous system: All the parts of the nervous system which are present along the main longitudinal axis of the body constitute the central nervous system. It consists of brain and spinal cord.

(2) Peripheral nervous system: It consists of the whitish thread like nerves which connect the various body parts with the CNS.

On the basis of their origin nerves are of three types, they are:-

(i) Cranial or cerebaral nerves: Those nerves which arise from the brain are called cranial nerves. They are 12 pairs in number. Cranial nerves I, II and VIII are sensory nerves; Cranial nerves III, IV, VI, XI, XII are motor nerves and cranial nerves V, VII, IX and X are mixed nerves.

(ii) Spinal nerves: Those nerves which arises from the spinal cord are called spinal nerves. There are thirty one pairs of spinal nerves. They are all mixed nerves.

(iii) Viseral nerves: These are special set of nerves which arise mainly from spinal cord but few arises from brain also. These nerves control many activities of the internal organs such as heart, lungs, kidneys, blood vessels, glands etc.

On the basis of their functions, nerves are of three types.

(a) **Sensory or afferent nerves:** These receive sensory impulses from sense organs to central nervous system (CNS).

(b) **Motor or efferent nerves:** These carry sensory motor impulses from (central nervous system (CNS) to effectors i.e. muscles and glands.

(c) **Mixed nerves:** These carry sensory as well as motor impulses to and from the central nervous system (CNS).

(3) Autonomic nervous system: It is the involuntary part of nervous system that controls the involuntary activities of various body parts. It includes all those responses against the stimuli which

are not under the control of individual. E.g. breathing, heartbeat, blood pressure etc. Autonomic nervous system is subdivided into two parts:-
(i) Sympathetic nervous system (ii) Parasympathetic nervous system
(i) Sympathetic Nerves system:- It prepares the body for violent actions during emergency e.g. It increases heart beat, increases breathing, dilates pupils of eyes etc.
(ii) Parasympathetic nervous system:- It helps in re-establishing normal conditions after violent act is over. E.g. it decreases heart beat , decreases breathing, constrict pupils of eyes etc.

Q. What is the importance of reflex actions? What is the role of brain in reflex actions?
Ans. Reflex actions result in quick response to otherwise harmful stimuli without the processing done by coordinating centres of central nervous system, thus prevent the damage to the body as in cuts and burns. Reflex actions allow the body to make autonomic involuntary adjustments, such as this – pupil reflex. Reflex actions control the internal processes like breathing rate, heart rate, peristalsis etc. Reflex action checks overloading of brain and has survival value.
Role of brain in reflex action: Some reflexes are controlled directly by brain especially midbrain and are called cranial reflex actions. The reduction in the pupil size when bright light is focused on eyes, is an example of cranial reflex action. The stimuli evoking the spinal reflex actions are also send to brain through ascending nerve tracts by spinal cord and the impulses from the brain are received by spinal cord through descending nerve tracts. Thus the brain becomes aware about the reflex actions performed by spinal cord.

(Q) Discuss central nervous system (CNS) in human beings? OR Discuss brain and spinal cord?
Ans) CNS consists of two parts: (1) Brain (2) Spinal cord
Brain (Encephalon)
The human brain is soft, whitish highly developed organ situated in the cranium or cranial cavity of the skull. It weighs about 1200 – 1400 gms.
Covering and protection: The brain is surrounded by three membranes called meninges. These are Piamater membrane (inner layer), Arachnoid membrane (middle layer) and duramater (outer layer). The space between these meninges is filled with a fluid called cerebro spinal fluid (CSF) which protects the brain from mechanical shocks.
Structure of brain: The adult human brain has three sub-divisions.
(1) Fore – brain or prosencephalon
(2) Mid-brain or mesencephalon
(3) Hind brain or rhombencephalon
(1)Fore brain: It is the anterior region and the largest part of the brain. It has three parts.
(i) Olfactory lobes (ii) Cerebrum (iii) Diencephalon
(i) Olfactory lobes: The olfactory lobes of brain of human beings are a pair of poorly developed, club shaped, widely separated bodies, which are visible from the ventral surface only. The olfactory lobes are concerned with sense of smell.
(ii) Cerebrum: Cerebrum makes bulk of human brain. It constitutes $4/5^{th}$ weight of the brain. It consists of two lobes called cerebral hemispheres. The two cerebral hemispheres are separated from each other by a very deep groove known as cerebral fissure. The two hemispheres are held together by a transverse band of nerve fibres called corpus callosum. The outer layer of cerebrum is the cerebral cortex which is made up of grey matter. The surface of cerebrum shows many folds and grooves called gyri and sulci, which increases the surface area (2000 sq.cm) of cerebrum to accommodate more nerve cells. There are three sulci present on the surface of each cerebral hemisphere which are very prominent as a result of which it is divided into four lobes.
(a) frontal lobe (b) parietal lobe (c) occipital lobe (d) temporal lobe

a) Frontal lobe: It controls facial muscular activities as well as higher mental activities.
b) Parietal lobe: It has areas for touch, taste, smell, temperature and conscious association.
c) Occipital lobe: It is the region for sight.

d) Temporal lobe: It is the region for auditory reception (hearing).

Besides above the cerebrum governs reasoning, learning, memorizing and intelligence. It also controls feelings of love, admiration and hatred.

It also perceives the sensory impulse such as pain, touch, taste, smell, hearing etc.

(iii) Diencephalon: It is a small rhomboidal lobe completely covered superiorly by large cerebrum but visible from inferior surface. The roof of diacoel is called epithalmus, floor hypothalamus and lateral walls called thalmi.

Dienceplon contains reflex centres for muscular and glandular activities. It has also centres of emotion, hunger and thirst. It also helps in maintaining body temperature and water salt balance of the body.

(2) Mid brain (Mesencephalon: It is the thick walled structure and small part of the brain. The mid brain or mesencephalon connects the anterior region of the brain to the posterior region of the brain. The mid brain is differentiated into corpora quardrigemina on the upper side and the crura cerebri on the lower side. Corpora quardrigemina consists of four lobes, i.e. upper lobes called superior colliculi and the lower lobes called interior colliculi .

Functions:

(1) Crura cerebri connects the hind brain with the forebrain.
(2) Superior colliculli controls the sight.
(3) Inferior colluculli controls the auditory impulse.

(3) Hind brain (rhomboncephalon): It is the posterior, small part of the brain. It is differentiated into three parts. (i) Pons varolli (ii) Cerebellum (iii) Medulla oblongata

(i) **Pons varolli:** It is a thick, white rounded ridge that carries impulse from medulla oblongata to forebrain.

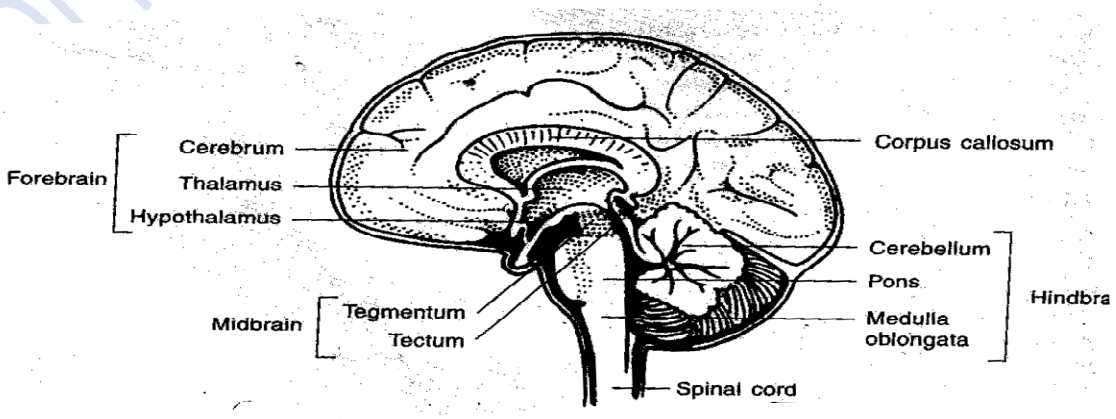
(ii) **Cerebellum:** It is the largest part of the hind brain. It consists of two large lateral lobes called cerebellar hemispheres in between which extends a narrow median strip called vermis. Cerebellum controls and co-ordinates the movements of various groups of muscles. Cerebellum also maintains the balance or equilibrium during movements.

(iii) **Medulla oblongata:** It is about 2.5cm thick and extends from pons varolli to spinal cord. Medulla oblongata controls most of the involuntary activities of the body. It also contains vital reflex centres. These centres are cardiac centre, respiratory centre, reflex centre etc.

Spinal cord

The spinal cord is unsegmental cylindrical structure and is about 45cm long in man and 43cm in woman. It arises from medulla oblongata and runs through neural canal of vertebral column or back bone. It is covered by three coverings called meninges. These are piamater (inner layer), arachnoid (middle layer)and duramater (outer layer). The spaces between these meninges are filled with cerbro spinal fluid (CSF), which protects the spinal cord.

Functions: The spinal cord conducts sensory and motor impulse to and from the brain. Its acts as a centre for reflex actions.



(Q) Describe the structure of neuron or nerve cell?

The neuron is the structural and functional unit of nervous system which receive, conduct and transmit impulses. Neurons are the largest cells present in the human body, sometimes reaching to 90 – 100cm in length

Structurally neuron consist of three prominent parts

(i) Cell body (ii) Dendrons & Dendrites and (iii) Axon

Cell body: It is also called cyton and soma, which is broad, rounded or stellate part of the neuron. It is filled with the dense cytoplasm called neuroplasm and the prominent nucleus. The neuroplasm possess prominent small granules called Nissl's granules which are infact groups of ribosomes and rough endoplasmic reticulum and are associated with protein systhesis. Neurotramsmitters are synthesied in the cell body by Nissl's granules. In addition, neuroplasm possess most of the cell's organelles like mitochondria, Golgi-Apparatus, neurofibrils, nerotubules but lack centrioles. Cell body is concerned with metabolic maintenance, growth and to receive impulses from dendrites and transmit them to axon.

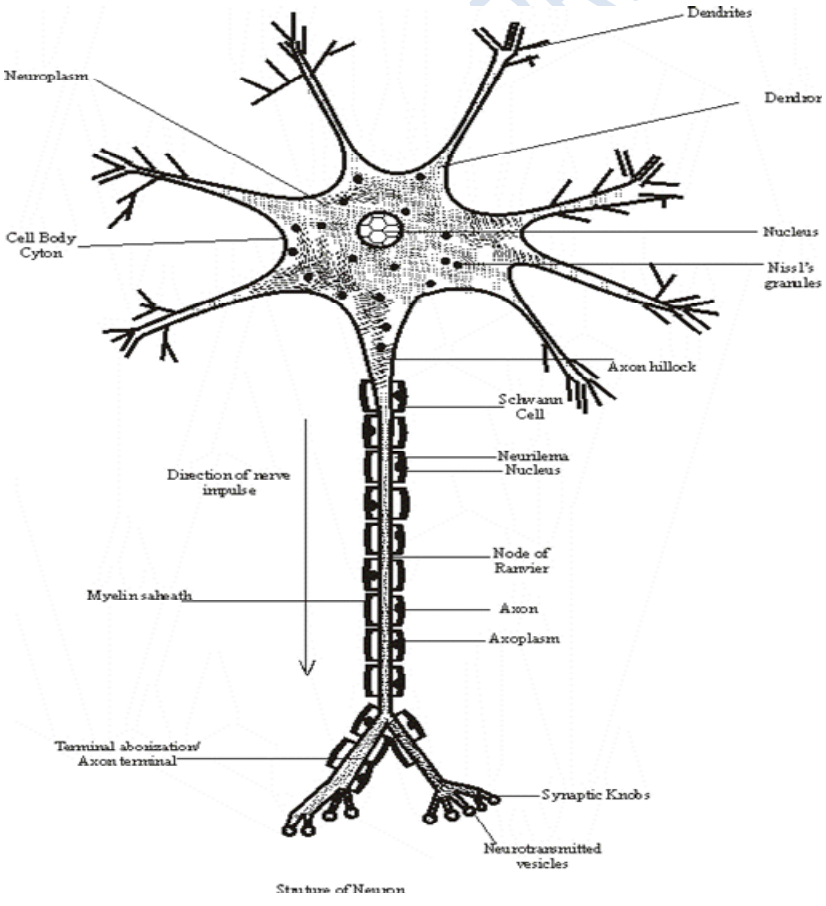
Dendrons & Dendrites: The wide nerve fibres extending from the cell body which conduct impulses towards the cell-body are called dendrons. Dendrons break up to into fine terminal branches called dendrites. The function of dendrons and dendrites is to acquire information and conduct it towards the cell body in the form of nerve impulses. Dendrons and dendrites also contain Nissl's granules and neurofibrils.

Axon: It is a single, long, cylindrical protoplasmic nerve fibre of uniform diameter arising from the cell body. The cytoplasm of the axon is called Axoplasm. The Axon terminates into highly branched filaments called terminal arborization.

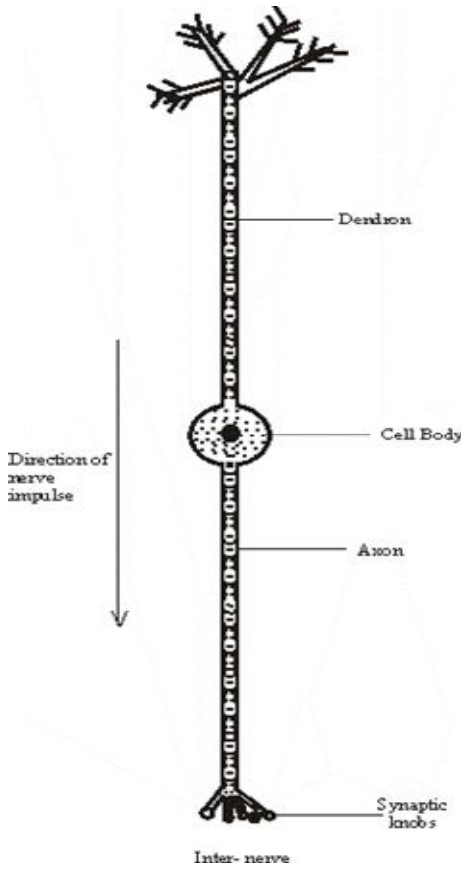
The axon is covered by three layers.

(i) Axolemma (inner most layer)
(ii) Myelin sheath (medullary sheath)
(iii) Neurolemma (outermost layer)

The axolemma and neurolemma are continuous sheath, where as the myelin sheath is not continuous one. It is constricted at intervals. These constrictions are known as nodes of ranvier. In addition to all the usual cell organelle neuroplasm also contains neurofibrils and Nissl's granule.



Structure of Neuron



Inter- nerve

(Q)Describe the functioning of nervous system?

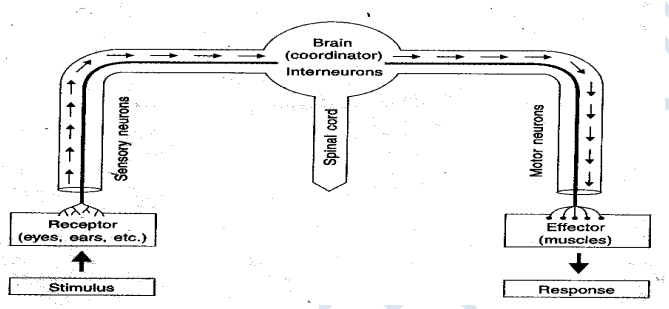
Ans) The nervous system receives a stimulus through a receptor organ, which coordinates it and responses through the effector organ. Thus a coordinated behaviour has five main components; stimulus, receptor, coordinator, effector and response. The stimulus of sound, sight, smell, etc. is perceived by receptor organs like eyes, ears, skin, etc. The brain and spinal cord are the coordinators which receive information in the form of message called nerve impulses, from receptor organs via neurons. The information flows to the effector organs, i.e. muscles, and the response occurs.

Communication through the nerve.

Nerve impulses pass along a neuron in one direction only. At one end, the neuron is connected to a sensory receptor that receives the message of stimulus and converts it into electro-chemical waves which are carried by the neuron. The fibre at this stage is said to be excited.

In a given neuron, the dendrites are the receptors, the cell body is the integrator and the ends of the axons are the transmitters. This means that the stimulus from the receptor organ is received by the dendrites, conducted to the cell body of the neuron and passed on through the axon to another neuron and finally to the effector organ. The axon endings of one nerve cell are loosely placed on the cell body or cyton of another nerve cell called Synapse

Signals travel from one neuron to another neuron across this junction (Synapse)



(Q) Discuss reflex action with suitable examples?

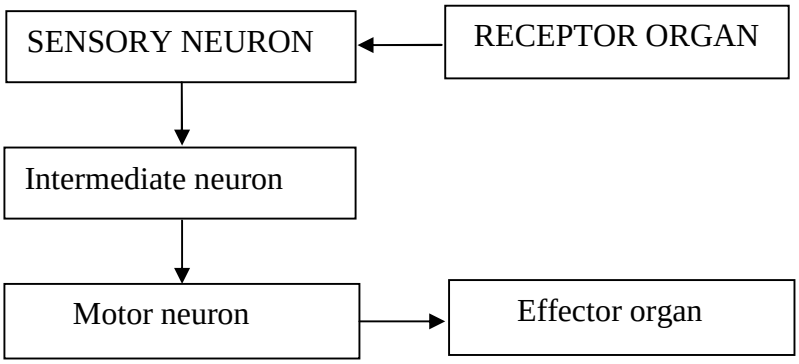
Ans) There are certain body responses which are immediate and do not require any processing by the brain. These responses or actions are controlled by spinal cord and are called reflex actions. Thus Reflex action may also be defined as a spontaneous, automatic and mechanical response to a stimulus without the will of the individual. Some examples of reflex actions are:

(a) Immediate withdrawal of hand if a person touches hot object unknowingly.
(b) Blinking of eyes.
(c) Sneezing, laughing, yawning etc.
(d) Watering of food on seeing food.
(e) Withdrawal of the leg by a man walking barefoot if he steps on nail.

Mechanism of reflex action (or) what happens in reflex action?

In reflex action, whenever there is any stimulus perceived by any receptor, it sets up sensory impulse that is carried to the central nervous system mainly spinal cord through sensory or afferent nerve. In the spinal cord, the sensory impulse is converted into a motor impulse and is then carried to effectors (muscles or glands) via motor nerves= The effector organ responds according to the message received. The path taken by nerve impulse in reflex action is called reflex arc. So the components involved in reflex arc are:

(a) Receptor or sensory organ.
(b) Sensory or efferent nerve
(c) Intermediate or internuncial neuron
(d) Motor or efferent nerve.
(e) Effector organs.



"Components of reflex arc"

E.g. When our hand accidentally touches a hot object the heat is sensed by the thermoreceptors present in the skin and, the receptor triggers nerve impulse in sensory neuron. It transmits message to spinal cord. In the spinal cord impulse is passed to connector neuron which, in turn, passes it to the motor neuron. The motor neuron transmits the instruction to a muscle to our arm. The arm muscle contracts and pulls our hand away from hot object.

According to origin reflex actions are of two types.

(1) Unconditioned reflexes: The inborn reflexes are unconditioned reflexes. It is present from the birth and is hereditary; e.g. respiratory reflexes, micturition reflexes, sexual reflexes, anckle jerk, bicep jerk etc are some of the examples of unconditioned reflexes.

(2) Conditioned reflexes: These are learned automatic reflex actions carried out by the body. These are acquired by an organisms during his life time through experience and learning.

(a) Crying and jerking hands by a child on seeing a burning candle.

(b) salivation of mouth on hearing the bell for lunch break are conditioned reflexes.

Whether brain is involved or not, the reflex actions are of two types; (a) Cerebral actions (b) spinal actions.

(a) Cerebral actions: The reflex actions in which brain is involved are called cerebral actions e.g. contraction of pupil of human eye in presence of bright light.

(b) Spinal actions: The reflex actions in which only spinal cord is involved e.g. withdrawal of hand on touching a hot object.

(Q) Differentiate between voluntary activities and involuntary activities of reflex actions.

Ans)

Voluntary activities	Involuntary activities
1) They are under the control of will power of the organism.	1) They are not under the control of the will power of organism.
2) They are not spontaneous.	2) They are spontaneous.
3) They are not automatic.	3) They are automatic.
4) They are controlled by the cerebrum of the brain.	4) There is no involvement of cerebrum in the control of reflexes.
5) The response may vary with respect to stimulus on different occasions e.g. on seeing snake one may decide to kill it and other may decide to run away from it.	5) There is always same response for one type of stimulus e.g. on touching hot object, the hand will always be automatically pulled away.
6) Examples are; riding a bicycle, picking up a pencil etc.	6) Examples are; salivation, vomiting etc.

(Q) What are plant hormones or phytohormones or plant growth regulators. Discuss their functions?

Ans) Phytohormones are defined as chemical substances which are produced naturally in plants and are capable of translocation and bring about control and coordination of various activities in plants. They are present in low concentration. There are five main types of naturally occurring phytohormones or plant growth regulators: (a) Auxins (b) Gibberllins (c) Cyto kinins (d) Ethylene (e) Abscisic acid (ABA)

(a) Auxins: Auxins (Greek-auxin means to increase) are a group of growth regulators discovered by F.W went in 1928. Auxins are synthesized in the shoot apex and young leaves of the plant. These chemicals move from cell to cell by the process of diffusion.

Functions:

(i) The root of the plant is positively geotrophic i.e. grows downwards and the shoot is negatively geotropic; i.e. grows upwards. Auxins help to control the geotropic behaviour of the shoot and root of plant.
(ii) Auxins stimulate tissues at the tips of the root and shoot to undergo rapid cell division.
(iii) Auxins cause considerable cell enlargement and cell elongation during the growth of plants.
(iv) Auxins have been found to increase the rate of formation of root initials.
(v) Auxins play an important role in the development of seedless fruits without pollination and fertilization. This phenomenon is known as parthinocarpy.
(vi) Auxins promote apical dominance in plants.
(vii) Auxins play an important role in the prevention of fall of leaves and pre-harvest fruit drop in plants.
(viii) Auxins promote various processes associated with reproduction like flowering, pollen grain germination, fertilization and fruit development.

(b) Gibberellins: Gibberellins are phytohormones which are synthesized in the chloroplasts of young apical leaves, buds, seeds and root tips. They move to all parts of the plant through xylem and phloem vessels. Till now more than 100 gibberellins have been identified e.g. GA_3 etc.

Functions:

(i) They promote cell enlargement and cell differentiation in plants in presence of auxins.
(ii) Gibberellins induce parthenocarphy in many plants.
(iii) Gibberellins enhance the phenomenon of apical dominance induced by auxins.
(iv) Gibberellins increase the size of fruits, flowers, stem and roots.
(v) Gibberellins induce flowering in long day plants but inhibit flowering in short day plants.

(c) Cytokinins: Cytokinins are the phytohormones which are synthesized in the endosperm of the seeds and roots of the plant

Functions:

(i) They promote cell division in plants.
(ii) They induce and control cell enlargement and cell differentiation.
(iii) They help in breaking the dormancy in buds and seeds.
(iv) They delay the ageing in leaves.
(v) They promote the opening of stomata and also promote fruit growth.

(d) Ethene or ethylene: Ethylene is a growth regulatory gaseous hormone and is produced by cell parts of all seed plants.

Functions:

(i) It has inhibitory effect on growth by inhibiting root growth and development of root buds.
(ii) Ethylene accelerates the abscission of leaves, flowers and fruits.
(iii) It induces ripening of fruits.
(iv) It is involved in breaking of dormancy of several plant organs.
(v) Ethylene also accelerates in plant organs process of ageing in plant organs.

(e) Abscisic acid (ABA) or dokigin or stress hormones: Addicot and his colleagues (1965) isolated a substance called abscisin from young cotton plant which accelerates the process of abscission. This chemical was named as abscisic acid and has wide varieties of physiological effects.

Functions:(i) It is major inhibitor of growth in plants and is antagonistic in action to auxins and cytokinins.
(ii) It causes ageing of leaves.
(iii) It promotes dormancy of seeds and buds.
(iv) It causes abscission of leaves and fruits.
(v) ABA is also called as stress hormone as it helps by helping the plants to cope with adverse environmental conditions.

(Q) What are plant movements? Discuss different types of movements in plants?
Ans) Movements in plants are in the form of bending, twisting or elongation of certain parts. It is characteristic of plants that do not show locomotion. However, movements of individual plant organs are possible and are modified by the sensitivity of the plant to stimuli. Plants show two main types of movements: (i) Autonomic or spontaneous movements. (ii) Paratonic or induced movements.

(i) **Autonomic or spontaneous movements**: They are independent of any external stimulus; i.e. they are self controlled and are not induced by external stimulus.

(ii) Paratonic or induced movement: They are caused by the result of application of external stimulus.

Classification of induced or paratonic plant movements.
Induced plant movements can be broadly classified into two types;
(1) Nastic movements (2) Tropic movements

(1) Nastic movements:

These are non-directional induced variation movements that occur due to the turgor changes induced by external stimulus such as light, temperature, touch etc. In nastic movements the part of the plant do not respond towards or away from the stimulus. These reveals quick responses to stimulus but does not involve growth. Nastic movements include:- (I) Nyctinastic movements (II) Seismonastic Movements

(I) Nyctinastic movements: Variations in the position of flowers and leaves of many plants in day and night are called nyctinastic movements or sleep movements. Nyctinastic movements include; (A) Photonastic movements and (B) Thermonastic movements.

(A) Photonastic movements: These are variations in non-directional position of plant parts (like petals of flowers) caused by the light stimulus, e.g. photonastic movements in the leaf of oxalis.

(B) Thermonastic movements: These are the variations in the position of plant parts caused by the change in temperature of surroundings.

(II)Seismonastic movements or Thigmonastic movements: These are the non-directional movements which occurs in response to touch or shock. These movements are very quick and are best seen in mimosapudica (touch me not) also called chhui-mui or sensitive plant or Lajwanti.

When we touch the leaves of the chui-mui plant with our finger, all the leaves of the chui-mui plant fold up and droop. After some time, the leaves regain their original status. In this type of movement no growth is involved. Instead, plant cells change shape by changing the amount of water which in turn results in the folding up and drooping of leaves.

Mechanism of folding up and droping of leaves:- The sensitive plant has pad like swellings called pulvini at the base of each leaf. These pulvini contain lot of water in their cells. Due to the internal water pressure in them, all the pulvini are very firm and hold the leaves above them upright. The pulvini also contains large intercellular spaces between their cells. The folding up of leaves of chui-mui plant on touching is due to the sudden loss of water from pulvini present at the base

of all the leaves of the sensitive plant which make the pulvini lose their firmness causing the leaves drop to fall. This happens as follows.

When the leaves of sensitive plant are touched with a finger, then an electrical impulse is generated which travels through ordinary cells.

This electrical impulse acts on a plant hormone. The plant hormone makes the water migrate from the cells of one half of a pulvinus to the intercellular spaces in the other half of pulvinus. This loss of water from half of pulvinus causes the pulvinus to lose its firmness and become limp due to which all the leaves above them collapse and fold up.

(2) Tropic movements or tropism:

The movement of a plant in the direction of stimulus is known as tropism. The stimulus may be light, force, gravity, chemicals, water etc. Tropic movements are induced growth movements of curvature that occur due to differential growth. Tropic movements are very slow and the movement of plant part can be either towards the stimulus or away from the stimulus. Depending upon the stimulus it is categorized as:

(I) Phototropism: It is the directional movement or orientation of the plant part in response to light stimulus. If the plant part moves towards light; it is called positive phototropism and if the plant part moves away from the light it is called negative phototropism, e.g. the stem or shoot of giving plant moves towards light and thus shows positive phototropism.

(II) Geotropism: It is the directional movement or orientation of the plant part in response to gravity. If the plant part moves in the direction of gravity, it is called positive geotropism. Alternatively, if the plant moves against the direction of gravity, it is termed as negative geotropism.

(III) Chemotropism: It is the directional movement or orientation of the plant part in response to chemical stimulus. If the plant part moves towards the chemical stimulus, it is called positive chemotropism and if the plant moves away from the chemical stimulus it is called negative chemotropism, e.g. during fertilization, growth of pollen tube towards the ovule in the ovary is an example of positive chemotropism.

(IV) Hydrotropism: If the plant part moves towards the water stimulus it is the directional movement or orientation of the plant part in response to water stimulus. It is called positive hydrotropism and if the plant part moves away from water stimulus it is called negative hydrotropism, e.g. the roots of the plants always grow towards the water are thus positively geotropic.

(V) Thermotropismn: It is directional movement or orientation of the plant part in response to stimulus of temperature.

(VI) Thigmotropism: It is directional movement or orientation of the plant part in response to the stimulus of contact or friction. This is common in tendril climbers, e.g. the climbing parts of the plants such as tendrils grow towards any support which they happen to touch and wind around that support. So tendrils of plants are positively thigmotropic.

Endocrinology

Endocrinology: (Greek: endon = within, krienien = to separate) the study of endocrine glands and role of their secretions is called endocrinology.

Gland: A cell, tissue or an organ which secretes useful chemical compound required for particular function.

Endocrine gland: These are those glands which lack ducts and pass their secretion into the surrounding blood to transport to the site of action. They are also called ductless glands and their secretions are known as hormones.

Endocrine system: It is the system of endocrine glands which secretes hormones.

Hormone: (Greek: hormoein = excite) the term hormone for the first time was coined by Starling in 1905. Hormones are informational molecules secreted by the endocrine cells in one part of the body and carried by blood to another part to stimulate or inhibit specific physiological process for the good functioning of the body as a whole.

Characteristics of hormone:

(i) Hormones are secreted by endocrine cells which act as chemical messengers.
(ii) They are carried by blood stream to target organs.
(iii) They are produced in trace amounts.
(iv) They act away from the site of production.
(v) They are soluble in water.
(vi) They are destroyed or inactivated as soon as their functions are over.
(vii) They are not species specific because hormones extracted from animals are found to be effective in man.
(viii) The hormones are generally slow in action.

(Q) Write the names of endocrine glands?

Ans)

(i) Pituitary gland
(ii) Thyroid gland
(iii) Para thyroid gland
(iv) Adrenal gland
(v) Islets of langerhans (pancreas)
(vi) Testes/ovary (glands)
(vii) Thymus
(viii) Pineal
(ix) Hypothalamus

(Q) Write weight, colour, location, structure and function of pituitary gland?

Or

Describe pituitary gland?

Ans) The pituitary or hypophysis is commonly called the master gland of endocrine system. The pituitary is a small reddish grey gland attached to the hypothalmus.

The pituitary gland is about the size of "pea" and measures about 1.2cm to 1.5cms. Pituitary gland weighs about 0.5gms.

Structure:

Pituitary gland is composed of 3 lobes and each lobe releases set of its own hormones.

(i) Anterior lobe or adenohypophysis
(ii) Intermediate lobe or pars-intermedia.
(iii) Posterior lobe or neurohypophysis.

(i) Anterior lobe: There are six hormones released by anterior lobe;

(a) F.S.H – Follice stimulating hormone
(b) L.H – Luteinising hormone
(c) T.S.H – Thyroid stimulating hormone
(d)A.C.T.H – Adrenocorticotrophic hormone
(e) G.H – Growth hormone or somatotrophin
(f) P.H – Prolactin hormone

Functions of anterior lobe hormones:-

Functions of F.S.H:-

(i) It stimulates sperm formation in males and growth of ovarian follicles in females.
(ii) In old persons it maintains sexual activity.

Functions of L.H (Luteinising hormone)

(i) In males L.H stimulates the enterstitial cells of testes to release androgen (testosterone)
(ii) In females L.H stimulates the corpusluteum to secrete progesteron.
(iii) In cooperation with F.S.H, it causes the rupture of follicle of ovulation.

Functions of T.S.H:-

(i) It stimulates growth of thyroid gland.

(ii) It stimulates thyroid gland to release its hormones T4 (thyroxine), triodothironine and calcitonin.

Functions of A.C.T.H:-

(i) It promotes and maintains growth and development of adrenal cortex.

(ii) It stimulates adrenal gland to release its hormones (i.e. glucocorticoid and mineralocorticois hormones).

Functions of G.H or S.T.H:-G.H stimulates growth and development of all tissues by accelerating protein synthesis and cell division and by retaining calcium in the bones.

Improper secretion of growth hormone produces three disorders.

(a)Dwarfism:- It is caused by deficiency of growth hormone from early age. Growth of long bones and the body stops prematurely, making the patient dwarf.

(b) Gigantism:- It is caused by excess of growth hormone from childhood . In this the patient has long bones with abnormal height.

(c)Acromegaly:- It is caused by the excess of growth hormone after adolescence.

Functions of prolactin:- It stimulates the growth of milk glands during pregnancy and the secretion of milk after delivery.

Hormones of intermediate lobe:-

It secretes a hormone name as: MSH

(1) **Melenocyte stimulating hormones**:- It stimulates the synthesis of black pigment melanin in the skin. This darkens the colour in certain animals (fishes, Amphibians)

Hormones of posterior lobe:-

There are two hormones released by posterior lobe

(1) Oxytosin (2) Vasopressin

Functions:

(1) Oxytosin:-

(1) It stimulates the contraction of smooth muscles (uterine muscles) during the birth of young one's.

(2) It stimulates mammary glands to cause release of milk during sucking, because of this role this is called birth hormone or milk ejecting hormone.

(2) Vasopressin or ADH(Anti Diureatic hormone)

(i) It decreases the loss of water from the body by increasing the reabsorption of water in the kidney(Renel tubules)

(ii) It also controls the contraction of smooth muscles of vessels.

Q3) Discuss the thyroid gland? What are hormones released by thyroid and their functions?

Ans: **Location:-** The thyroid gland surrounds the front part of the larynx and upper part of the trachea in the neck.

Structure:- Thyroid gland consists of two lobes connected by narrow band called isthmus. Each lobe is composed of numerous spherical masses called follicles. Each follicle is covered by basement membrane. In the centre of each follicle contains a cavity filled with collidal material. Thyroid gland is composed of two types of cells i.e. principal cells and Para follicular cells or C cells.

Hormones:- The thyroid gland releases three hormones

(1) Thyroxine (T4) (2) Tri-iodo thyronine (T3) (3) Calcitonin

(1)Functions of (T4 & T3) :-

(a) Both T3 & T4 control general metabolism by regulating the rate of oxidation & production of energy.

(b) They maintain Basal metabolic rate of body.

(c) They stimulate protein synthesis and hence improve growth.

(d) Thyroxine also controls the working of kidneys.

(2)Calcitonin :- It is secreted by "C" cells. It regulates the concentration of calcium and phosphorus in the blood. Calcitonin decreases blood calcium ion concentration.

Improper Secretion of T3 & T4 Causes following disorder.

(1)Iodine deficiencies Goiter:- It is caused by the deficiency of iodine in the diet. The disease is common in hilly areas. It causes enlargement of thyroid gland.

Swollen neck is one of its symptoms of the disorder.

It may lead to Cretenism or myxodema.

(i) Cretenism

(ii) Myxodema (Gulls Disease)

(i) Cretinism:-It is caused by hyposecretion of thyroid hormones in infants. Affected child is called cretin. The symptoms appear after 6 months of birth which are as follows:

(a) Cretins are short and fingers are club shaped.
(b) Bones and teeth are deformed. (b) Tongue are protruding and saliva is dribbling.
(c) Cretins are idiots. (d) Appetite is reduced. (e) BMR and body temperature is also low.

(ii)Myxodema or Gulls diseases:- It is the disorder produced in adults as a result of hyposecretion of thyroid

Some of the symptoms are:

(a) Face is swollen. (b)Hairs fall out from Axilla, Pubic, Head etc.
(c) Sex degenerates and appetite is reduced. (d) BMR is lowered
(e) Respiratory rates are reduced. (f) Heart rate and cardaic out put is also low.

Grave's disease or Exothalmic Goiter:- It is caused by hyper secretion of the thyroid hormones due to enlargement of thyroid gland. Some of the symptoms of Grave's diseases are:

(a) Eye balls are protruded with a staring look.
(b) Body temperature is raised.
(c) Patients are emotional and restless.
(d) The skin becomes soft, moist, flushed.
(e) Blood sugar level and iodine level are raised.

The disorder can be rectified by the removal of part of the gland.

Q: Describe parathyroid gland?

Ans:- The parathyroid are situated on the posterior surface of the thyroid lobes.

STRUCTURE

The parathyroids are four small, oval gland, two on each side. The cells of parathyroids are arranged in compact mass and are of two types i.e. small cheif cells and large oxiphill cells.

Hormones of Parathyroid

The hormone secreted by parathyroid is parathormone also called collip's hormone.

(1) Parathoromone and Calcitonin (thyroid) hormone act antagonistically to regulate calcium phosphorus level in the body.
(2) PTH increases blood calcium level to normal by drawing calcium from bones into the plasma by increasing absorption of digestive tract by drawing loss of calcium in the urine.
(3) PTH lowers blood phosphates by increasing elimination of phosphate in the urine.

Q: Describe Adrenal gland?

Location:-The adrenal also called suprarenals, are paired glands placed in the top of the kidneys.

STRUCTURE :-The adrenals are conical, yellowish bodies. Each adrenal gland has two distinct regions namely adrenal cortex and adrenal medulla.

(1) **Adrenal Cortex:** The adrenal cortex is an external, firm pale yellowish- pink tissue. It further shows three concentric regions i.e. outer, middle and inner. Each region produces its own set of hormones.

Hormones of adrenal cortex

(I) **Mineral Corticoids;-** These hormones are secreted by the outer region of adrenal cortex. They regulate mineral metabolism and control the sodium potassium ratio in the extracellular and intracellular fluids. Aldosterone is the major mineralocorticoid.

(II) **Gluco corticoids:-** These hormones are secreted by the middle region of adrenal cortex. They regulate the metabolism of carbohydrates, proteins and fats. The most important glucocorticoid is cortisol.

(III) **Sex corticoids:-** These hormones are secreted by both the middle and inner region of the adrenal cortex. They include small amounts of both male and female sex hormones. The male hormone is testosterone which stimulates the development of male secondary sexual; characters such as distribution of body hair, deepning of voice etc.

The female hormone is oestrogen, which stimulates the appearance of secondary sexual characters such as enlargement of breasts, onset of menstrution etc.

Adrenal Medulla:- The adrenal medulla is an internal soft, dark reddish brown tissue. The adrenal medulla releases two similar hormones.

(I) Adrenalline (epinephrine) (ii) Noradrenaline (Nor epinephrine)

FUNCTIONS(a) The action of both the hormones are wide spread through out the body and prepare the animal for action situation.

(b) They allow the body to respond to sudden demands imposed by stress such as exercise, low blood pressure, anger, passion and excitement.

(c) Adrenaline and Non-adrenalline have the same basic effect. However, the two differ in their influence on the blood vessels. Nor-adrenaline causes vasoconstriction of all blood vessels.

Whereas adrenaline brings about vasoconstriction of the blood vessels supplying the skin and gut and vasodillation of blood vessels supplying muscles and brain.

Both the hormones are produced and effective under emergency conditions, hence this hormone is called emergency hormone and its secretion makes the individual ready to fight and hence medulla is called gland of fright, flight and fight.

Q: Describe Pancreas?

Ans:- **Location:- Pancreas lies below the stomach.**

The pancreas is an elongated, yellowish gland. It consists of large lobules (acni, alveoli). In between the acni are present some cells which constitutes the endocrine part of the gland. The endocrine part of the pancreas is called islets of langerhans.

The islets of langoerhans is composed of 3 types of cells.

(1) A Cells (b) B Cells (c) C Cells

Hormones of the islets of langerhans:

Islets of langerhan's secrets two hormones.

(1) Insulin (2) Glucogen

(1) **Insulin:-** Insulin is secreted by 'B' cells of islets of langerhan's.

Role of insulin :- The main role of insulin is to lower the blood sugar level. It acts in following ways to bring down sugar level of blood.

(a) It makes cells more permeable to glucose. (b) It enhances glucose oxidation in the cells.

(c) It increases rate of conversion of blood glucose into liver glycogen.
(d) It promotes the conversion of glucose into fat deposits.

Deficiencies of insulin:- Deficiency of insulin causes a disease called diabetes mellitus. The symptoms of diabetes mellitus are as follow:

(a) **Hyperglycaemia:-** Pronounced increase in blood sugar level.
(b) **Glycosuria:-** Appearance of sugar in urine.
(c) **Polyueria:-** large vol. of urine about 10 lit/day.
(d) Frequent urination
(e) Delayed healing of wounds
(f) The diabetic has blured vision and is weak, tired, irritable and under weight.

(2)**Glucogon:-** It is secreted by A Cells of islets of langerhans.

Role of glucogon: Its main role is to raise blood sugar level. It has opposite effect of insulin. It promotes process of glycogenlysis, gluconeogenesis.

Both insulin and glucogen act antagonistically and by virtue of it maintains proper blood glucose concentration.

(Q) Write a short note on testes.

(1) Location: Are located in the Scrotum. Testes are heterocrine-glands i.e. their main function is to produce sperm cells. Besides that the interstitial cells of tests secret male sex hormones such as testosterone.

Functions of testosterene:-

(i) It stimulates the male reproductive system to grow into full size and become functional
(ii) It stimulates the formation of sperms (Spermatogenesis) in the seminaferous tubes.
(iii) It stimulates the development of male secondary sexual characters such as beard, growth and distribution of hair on body, deepning of voice, broadening of shoulders.

Q: Describe Ovary?

Ans:- Ovaries lie in the abdomen and act as heterocrine glands i.e. it is responsible for the development of egg. In addition, the ovary secretes the following hormones.

(1) Oestrogen. (2) Progesterone (3) Relaxin

(1) **Oestrogen:-** These are secreted by the cells of ovarian follicle surrounding the maturing ovary. It performs following functions:
(i) They stimulate the female reproductive tract grow to full size and become functional.
(ii) They stimulate oogenesis in the ovary.
(iii) They also stimulate the development of secondary sexual characters such as enlargement of breasts ; broadening of Pelvis; growth of pubic and auxiliary hair, deposition of fat in the thighs and onset of menstrual cycle.

(2) **Progesterone:** It is secreted by the corpus luteum. The latter is a yellowish body formed in the empty Grafian follicle after the release of the ovum. Its hormone suspends ovualation during pregnancy, fixes the foetus to the uterine wall, forms placenta, and controls the development of the foetus in the uterus.

(3) **Relaxin:-** It is produced by the corpus luteum at the end of the gestation period. It relaxes the cervix of the uterus and ligaments of the pelvic girdle for easy birth of the young one.

Q: Write a short note on pineal gland?

Ans:- Pineal gland or Epiphysis is a flattened cone shaped grey body measuring about 5-8mm in length. The pineal gland lies under the corpus callosum between the two cerebral hemispheres of the brain.

Hormones:- The pineal secrets a hormone named as malatonin.

Functions:- (i)It causes concentration of pigment granules in the melatocytes, making the skin colour lighter in certain animals.

(ii)Melatonin inhibits ovarian functions and slows down puberty.

Q: Write a short note thymus?

Ans: Thymus is partially endocrine gland and partially lymphoid structure. It is located in part of the chest covering the lower end of trachea.

Thymus is bilobed structure and has two regions. Peripheral cortex and central meddula.

Hormones:- It secretes thymosin and thymin and performs following functions:

(i) Thymosin is involved in the regulation of neuro transmission.

(ii) It regulates growth, stimulates proliferation of lymphocytes.

Q: Write a short note on hypothalamus?

Ans:- Location:- Hypothalamus is the base of the diencephalon, a part of forebrain.

Structure:- Hypothalamus is composed of nervous tissue.

Hormones:- The hormones released by hypothalamus are called neuro hormones. The neuro hormones are carried by the blood to the anterior lobe of the pituitary gland and stimulate the later to release its hormones on this account, such hypothalamic hormones are also called releaser hormones (R.H).Certain hypothalamic hormones inhibit the secretion of pitiuary hormones. These are termed as inhibitory hormones.

The main hypothalamic hormones are:-

(1) **T.R.H(Thyroid releasing hormone):-** It stimulates anterior pituitary to secrete T.S.H

(2) **A.R.H (Adrenocorticotrophin Releasing Hormone):-** It stimulates anterior pituitary to release A.C.T.H.

(3) **F.S.H-R.H (follicular stimulating hormone –releasing hormone**) it stimulates anterior Pituitary to secrete F.S.H.

(4) **L.H-R.H(Luteinising hormone releasing hormone) :-** It stimulates anterior pituitary to secrete L.H.

(5) **G.H-R.H. (growth hormone releasing hormone**):- It stimulates anterior pituitary to secreate G.H.

(6) **G.H-R.I.H.(growth hormone releasing inhibiting hormone):-** It inhibits the secretion of G.H. from anterior pituitary.

(7) **P.R.H.(prolacting releasing hormone):-** It stimulates anterior pituitary to release prolactin

(8) **P.R-I.H.(prolactin releasing inhibiting hormone):-** It inhibits the secretion of prolactin from the anterior pituitary.

(9) **M.S.H-R.H.(melenosite stimulating hormone releasing hormone):-** It stimulates intermediate lobe of pituitary gland to secrete M.S.H

(10) **M.S.H.-R.I.H.(Melenosite stimulating hormone releasing inhibiting hormone):-** It inhibits the secretion of MSH from the intermediate lobe of pituitary gland.

Q: Write a short note on feed back mechanism hormonal secretion?

Ans:-Feedback mechanism of hormone secretion

Hormones are required for various functions in our body. To perform these functions a particular hormone may be required in a particular amount at a particular time, for which a control system is required.

Any control system should have a feedback mechanism to prevent excessive reaction or overreaction. For example, the hypothalamus produces the releasing hormone for thyroid stimulating hormone (TSH-RH), which in turn stimulates the pituitary to produce thyroid stimulating hormone (TSH). The TSH activates the thyroid gland to secrete thyroxine. If the level of thyroxine in the blood is less than normal, it has positive feedback effect on the hypothalamus and pituitary to produce more TSH-RH and TSH, respectively. If the level of thyroxine is more than normal in the blood, a negative feedback effect is seen on the hypothalamus and the pituitary so that they produce less of TSH-RH and TSH, respectively. Thyroid stimulating hormone (TSH) and thyroxine regulate each other's level just like the requirement-supply kind of situation

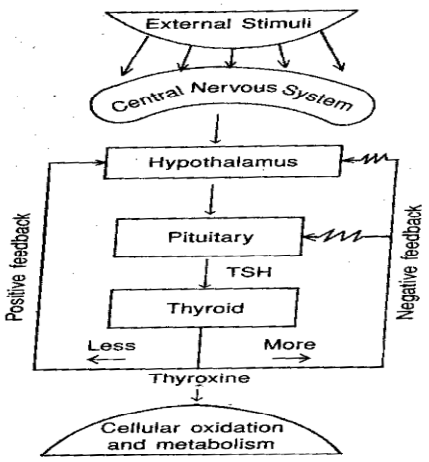


Fig. 5.9 Feedback system to control the metabolic rate

Textual questions

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

Ans.

Reflex Action	Walking
1. It is spontaneous action.	1. It is non spontaneous action.
2. It is an automatic action.	2. It is not an automatic action.
3. It occurs with out animals will and is in voluntary action.	3. It occurs with the animals will and is voluntary action.
4. Here brain is not involved immediately.	4. Here cerebellum (part of brain) is controlled.

Q.2 What happens in synapse between two neurons?

Ans: The gap between terminal portion of axon of one neuron and the dendron of other neuron is called Synapse. The synapse acts as a one-way valve to conduct impulse in one direction only. This is because neuron transmitters a chemical substance is secreted only on one side of the synapse i.e. on axons side by the bulb like terminal of the axon called synaptic bulb. When a nerve impulse arises as the axon terminal, it causes synaptic bulbs to release neuro transmitter. Neuro transmitter diffuses easily and carries impulse across the synapse and passes it to the dendron of the neuron. Thus a nerve impulse passes from axon of one neuron to dendron of other neuron through a synapse.

Q.3 Which part of brain controls equilibrium of body?

Ans. Cerebellum part of hind brain maintains posture and equilibrium of the body.

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

Ans. We have olfactory receptors in our nose. These receptors detect the smell of agarbati and transmits this information in the form of nerve impulse to the olfactory lobes of the fore-brain via nerve. The message of smell is analyzed and interpreted there (in the brain).

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

Ans. Reflex actins generally involves spinal cord for quick response to specific stimulus. However, the information input also goes on, to reach the brain where thinking process occurs.

Q.6 What are plant hormones?

Ans. Refer additional questions

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

.

Movement of leaves in S. Plant	Movement of shoot towards light
1. It is the seimonastic movement.	1. It is tropic movement
2. Here sensitive plant responds to touch by folding and drooping.	2. Here shoot of the plant moves toward light and show positive phototrosms.
3. It happens very quickly.	3. It happens very slowly.

4. Here growth is not involved instead plant cells change shape by changing the amount water in them.	4. Here growth is involved i.e., Plant grows by cell division, cell enlargement and cell elongation etc.

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

Ans. Auxin is the plant hormone that promotes growth in plants.

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

Ans. Axins are the hormones, synthesized at the shoot tip and helps the cell to grow faster, thus acts as a growth promoter in plants. When tendril of a plant comes in contact withy a support, axins diffuse towards the side which is not in contact with the support. This stimulates the cells to grow longer on the side of the tendril which is away from the support. Thus axin promotes the growth of the tendril around the support.

Q.10 How does chemical coordination take place in animals?

Ans. The chemical coordination in animals takes place by the chemical secretions called hormones, which are released by endocrine glands, when stimulated. The hormones are directly poured into the blood which circulates them to all the body tissues cells. These hormones act on specific organs called target. The blood contains all the hormones but the cells of a target organ pick up the required hormone only and ignore all others. The target cell recognizes its appropriate hormone due to presence of specific protein molecule called receptor. Non target cells, on the other hand, lack these receptors. Therefore, they do not respond to the circulating hormones. A hormone now binds to specific receptor and delivers its message to the target cell by changing the shape of the receptor.

Q.11 Why is the use of iodized salt advisable?

Ans. Iodine is essential for the synthesis of thyroxin (T4) and tri-iodo-thironine (T3) hormones in the thyroid gland. Both Thyroxin and triode thironine are the hormones which perform various functions of the body like regulation of protein, carbohydrate and protein metabolism in the body for growth.

Deficiency of iodine results in hyposecration of thyroid hormones which in turn results iodine deficiency goiter. In which the patient shows following symptoms.

1. There is enlargement of thyroid gland.
2. The patient lacks alertness intelligence, and also has slow heart beat, lower blood pressure, decreased body temp. etc.

Thus, use of iodized salt is advisable to prevent iodine deficiency in the body.

Q.12 How does our body respond when adrenaline is secreted into the blood .

Ans. Adrenaline also called Epinephrine, a emergency hormone secreted by adrenal medulla of adrenal gland. Adrenal line is widely spread throughout the body to whip up the metabolism for preparing the animal to face special conditions created by physical stress such as fall in blood pressure, pain, cold, injury, anger, fear passion, shock or grief etc. All these conditions need more energy which is provided by (done by adrenaline) increasing heart beat, blood pressure, respiratory rote, blood supply to heart and skeletal muscles and brain.

This hormones also stimulates the break down of liver and muscle glycogen to provide energy for respiration.

Q.13 Why are some patients of diabetes treated by giving infections of insulin?

Ans. Insulin has the function that it lowers the glucose (sugar) level in the blood. The patient who has insulin deficiency or have insufficient supply of insulin is called diabetes mellitus in which the urination person excretes sugar in urine, feels excessive thirst and also does excess. In order to overcome this disorder, the patient is administrated with injection so as to lower its sugar level in blood

Q.14 Design an experiment to demonstrate hydrotropism.

Ans. Experment :-To study the response of plant to water hydrotropism)

Requirements:- Two glass trough, clay port etc.

Method:-

1. Take two glass troughs A and B and fill them with soil upto $^{2}/_{3}$ rd level. Plant a tiny seedling in each trough.
2. Now, place a small day port in the soil in trough B.
3. Water the soil daily in trough A uniformly,However in trough B, put water daily in clay pot only.
4. After few days dig up the seeding in both the glass troughs with out damaging the roots we noticed that in trough A , the root of seeding, bent towards the direction of clay pot containing water.

Observation and conclusion:- In trough A, soil is watered uniformly daily, therefore, the root of seedling gets water equally from all sides. Hence it grows straight downwards, on the other hand, in trough B, the root of seedling only gets water that oozes out of the clay pot buried soil. Therefore in trough B, the root of seedling grows by bending towards the clay pot.

This experiment the reveals the response of seedling (plant part) towards water (positive hytotropism)

Q.15 Which of the following is plant hormone?

Ans. Cytokinin

Q.16 The gap between two neuron is called a

Ans Synapse

Q.17 The brain is responsible for

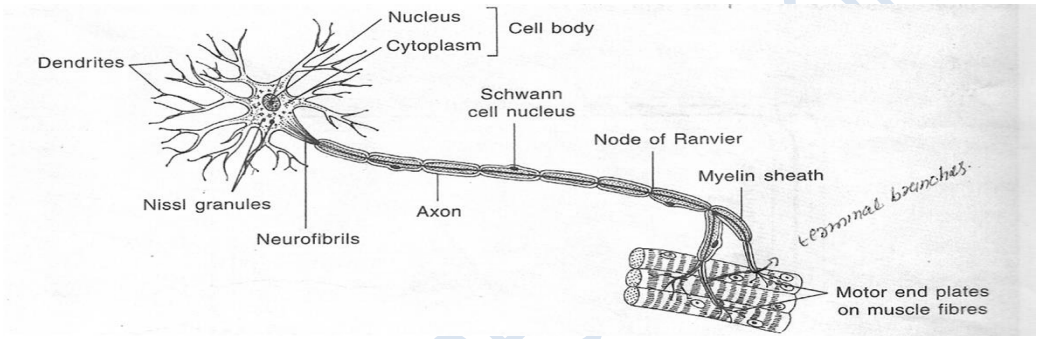
Ans. All the above (thinking, regulating the heart beat, balancing the body etc.)

Q.18 What is the function of receptors in our body? Think of situation 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 stimuli these receptors ten forms the information in the form of nerve impulse to central nervous system where merrage is interpreted and appropriate instruction is sent to effectors which reveals respires when receptors do not function normally the environmental stimuli are not able to creat neave impulse and body does not respond

Q:19 Draw the structure of neuron and explain its functions?

Ans:- Structure of neuron:-



Functioning of neuron:- Neurons present in the sense organ detect changes in the environment and transmit this information to central nervous system which interprets the message and send instructions via neurons to effectors for appropriate response.

In a given neuron, the dendrites are the receptors, the cell body is the integrator and the ends of the axons are the transmitters. This means that the stimulus from the receptor organ is received by the dendrites, conducted to the cell body of the neuron and passed on through the axon to another neuron and finally to the effect organ. The axon endings of one nerve cell are loosely placed on the cell body or cyton of another nerve cell called Synapse.

Signals travel from one neuron to another neuron across this junction (Synapse)

Q:20 How does phototropism occurs in the plants?

Ans:- We know that the stem and leaves of the plants grow towards light this is called positive phototropism. This mechanism of positive phototropism can be explained on the basis of hormonal effect i.e. auxin. The auxins are produced in the tip of the plant by meristematic tissue (shoot apical meristem) when sun light falls on the plant the auxins are distributed uniformly to all sides of the plant due to the uniforml distribution of auxins the uniform growth of the plant takes place in all sides as a result the plant grows in un upward direction towards sunlight.

Q.21 Which signals will get disrupted in case of spinal cord injury?

Ans. Spinal cord performs two important functions:

1. Spinal cord serves as two way conduction path between peripheral nerves and the brain.
2. Nuclei in the spinal card function as reflex centers which control spinal reflexes

So in case of spinal. Injury reflex actions and involuntary actions will get disrupted mainly but voluntary actions will also get disrupted because many nerves of the body are connected to brain via spinal cord.

Q.22 How does chemical coordination occur in plants?

Ans.In plants, chemical co-ordination occurs with the help of plant hormones called phytohormones. Specific hormones are secreted in one part of plant and these diffuse to reach specific sites to produce the effect the response of plants to sunlight across by bending of the shoot towards it. It occurs due to slow growth movements and the phenomenon is called positive phototropism.

Q.23 What is the need for a system of control and co-ordination in organisms?

Ans In multicellular animals, body is very complex therefore, it is necessary that various organs (parts) of the body of an organism work together in a proper manner to produce proper reaction to a stimulus. For proper control and coordination, higher animals have evolved nervous system and endocrine system.

Q.24 How are involuntary action and reflex different from each other?

Ans. Reflex actions are spontaneous automatic, mechanical responses to specific stimuli without the will of animal. In reflex actions, spinal cord is generally involved. Involuntary actions also occur without the will of the animal and animal has no choice in them however, these are regulated by either mid-brain or kind brain.

Q.25 Compare and contrast nervous and hormonal mechanism.

Nervous information	Hormonal information
1. It is sent as an electrical impulse along axons, and as a chemical across synapse.	1. It is sent as a chemical messenger (hormones) via blood stream.
2. Information travels rapidly in milliseconds	2. Information travels slowly
3. It gets response immediately	3. It gets response usually slowly
4. Effects of nerve impulse are short lived.	4. It has prolonged effect.
5. Information is direct to specific part (receptor) i.e. one or few nerve fibres, gland cells or other nervous.	5. Information is spread throughout the body by blood stream from which the target calls or organs pick it up.
6. It has no effect on growth	6. It effects growth
7. It does not influence chemical changes and cannot regulate metabolism	7. It brings about specific chemical changes and regulates metabolism.

Q.26 What is the difference between the manner in which movement in the sensitive plant and movement in our legs takes place?

Movement in Sensitive plant	**Movement in Legs**
1. It is paratonic movement where sensitive plants respond to stimulus of contact and friction. 2. Here plant cells change shape by changing the amount of water in them. 3. Here plant harmones called phyto hormones are involved for movements. 4. It involves hormonal control.	1. It is voluntary action. 2. Here cells involved in the movements of legs change the shape and arrangement of proteins were walking. 3. It is controlled by cerebellum, part of hind brain. 4. It involves

Terminology

(1) **Coordination**:-The working of various organs of the body of an organism in a proper manner to produce proper reaction to a stimulus is called coordination.

(2) **Stimulus**:-The changes in the environment to which the organisms responds and react are called stimuli (Sing-stimulus)

(3) **Receptor:-**It is a nerve cell or group of nerve cells which is sensitive to a specific stimulus or to specific change in the environment.

(4) **Effecter:-**An effector is some muscle or gland in specific part of the body which produces suitable response.

(5) **Dormancy**:-It refers to a resting, in active condition of the seed when it fails to germinate even though the environmental conditions usually considered favorable for active growth are present.

(6) **Partheno carypy** :- Development of seedless fruits with the act of fertilization.
(7) **Homeostasis**:- The mechanism of maintaining constancy of internal environment in the living organisms.
(8) **Apical dominance:-** The terminal bud at the apex of a shoot, suppresses the lateral bunds into branches. This phenomenon is called apical dominance.
(9) **Synapse:-** The lose connection between the axon endings of one nerve cell and syton of next nerve cell is called synapse.
(10)**Synaptic cleft:-** The space between adjacent neurons is called the synaptic cleft.
(11) **Synaptic bulb:-** The synaptic cleft is about 20mm in width. The axon terminal of a presynaptic neuron has a bulb-like appearance known as synaptic bulb