Control and Coordination

The organisms need this system to carry on various processes in a harmonious manner. They need specialized tissues to control and coordinate them. **Nervous coordination in animals-**

In animals control and coordination is provided by **nervous and muscular tissues.** Our body receives information from the environment with the help of special cells called **nerve cells.** These cells are present in the sense organs like inner ear, nose, skin, and tongue. **Gustatory receptors** detect taste and **olfactory receptors** detect smell. Diagram of nerve cell page 115 NCERT.

How is impulse transmitted?

The information received at the dendrite tip of the nerve cell sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body then along the axon to its end. At the end of the axon the electrical impulse sets off the release of some chemicals. These chemicals cross the synapse start a similar reaction in the dendrite of the next neuron and then ultimately deliver impulse to muscle cells and glands.

What happens in the synapse?

In the synapse electrical impulse sets off the release of some chemicals. These chemicals cross the synapse and start a similar reaction in the dendrite of the next neuron and then ultimately deliver impulse to muscle cells and glands

. **Central nervous system-** It is formed by Brain and Spinal cord.

Brain- It is the maia coordinating centre of the body. It is a very delicate organ so is well protected in the bony brain box. It is covered by three membranes which have cerebrospinal fluid in between to absorb external shocks.

Brain has three main parts- Fore brain, mid brain and hind brain.

Fore brain-Its main parts are Olfactory lobes and Cerebrum. It has regions which receive sensory impulses from various receptors. These areas, are for hearing, smell, sight etc.It is the sight of intelligence, memory, and thinking.

Mid brain- it connects fore brain and hind brain. It controls reflexes involving eyes and ears.

Hind brain-Its parts are -

Cerebellum-It coordinates muscular/.movements, maintains body posture and equilibrium.

Pons-It carries all sensory and motor neurons between brain and spinal cord

medulla oblongata -It has reflex centers to control involuntary activities like swallowing, coughing, sneezing, vomiting, heart beat and breathing

x Diagram of brain page 118 NCERT **How does nervous tissue cause action?**

When a nerve impulse reaches the muscle cell, it moves by changing its shape. The muscle cells have special proteins that change their shape and their arrangement in the cell in response to nervous electrical impulses. When this happens, new arrangement of proteins gives the muscle cells a shorter form so they contract.

Spinal cord-

It extends from medulla oblongata. It is well protected in the vertebral column and is covered by three membranes with cerebrospinal fluid in between to absorb external shocks. It is the site of all reflex actions

Need of reflex actions- Thinking tissue in our body consists of dense network of neurons. It lies in the forward end of the skull and receives signals from all over the body. It thinks about the stimulus before responding to them. It takes some time during which some actions can cause harm to us. So the nerves that detect any stimulus are connected to muscles in a simpler way. The process of detecting the signal and responding to it is completed quickly. This is done during reflex action which is controlled by spinal cord. E.g. when we touch some thing very hot we immediately move our hand away without thinking about it. Higher animals have developed this efficient system of functioning for quick responses. Blinking of eye, sneezing, coughing are some of the reflex actions A reflex action can be defined as a spontaneous, response of the body to a stimulus without thinking or conscious thought. This action allows body to respond rapidly without conscious invoivemetof brain

The nerve pathway involved in a reflex action is called reflex arc.

Reflex arcs are formed in the spinal cord although the information goes on to the brain also. Diagram 7.2 page 117 NCERT

Peripheral nervous system -

!t is formed by the nerves arising from brain and spinal cord. Cranial nerves arise from brain. There are 12 pairs of cranial nerves. Spinal nerves arise from spinal cord. There are 31 pairs of spinal nerves. These nerves connect brain and spinal cord to various organs of the body. **Outline diagram of Reflex arc.**

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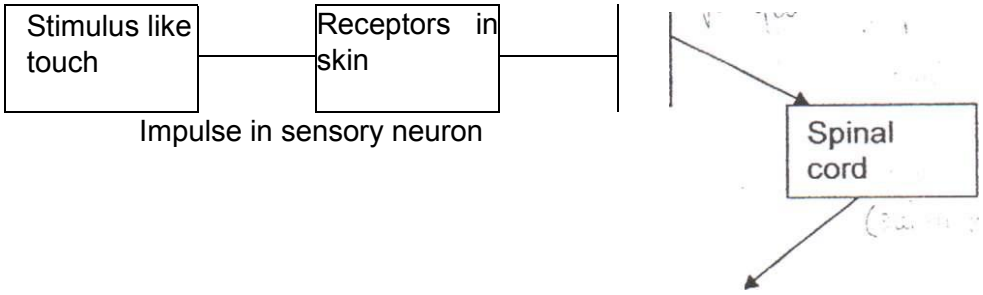

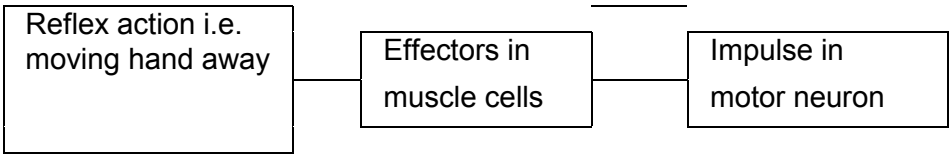

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Hormones-The chemical substances secreted by endocrine glands/ are hormones
Endocrine glands\the ductless glands are endochrine glands .their functions are:-

Endocrine glands- the ductless glands are endocrine glands. Their features are-

a) They secrete hormones
b) Hormones are poured into blood stream
c) They act on specific target organs
d) They are required in small quantity.

Location of various glands- refer to Fig.7.7 page 124 NCERT book **Importance of Chemical communication-**

In animals there are electrical impulses to carry messages but there are limitations to the use of electrical impulses. Firstly they reach only those cells that are connected by nervous tissue and not each and every cell of the body. Secondly, once an electrical impulse is generated in a cell and transmitted, the cell will take some time to reset its mechanism before it can generate and transmit electrical impulses. So most multicellular organisms have chemical communication. The advantage of chemical is also that it diffuses all around the original cell. The other cells around can detect the information& transmit it. These chemicals called hormones show great diversity in multicellular organisms. **Various endocrine glands, their locations and functions**

	Name	Location	Hormone and any other feature
r	Hypothalamus	Lower side of brain	Releasing hormones to regulate secretion of hormones by pituitary
	Pituitary	Lower side of brain attached to hypothalamus	Growth hormone, it regulates growth and development of the body , over secretion causes gigantism and under secretion causes dwarfism
3	Thyroid	In the throat part	Secretes thyroxin, regulates metabolism of carbohydrates, fats and proteins, needs iodine to make thyroxin, iodine deficiency causes goiter i.e. swelling of thyroid gland in the neck region
4	Parathyroid	Near thyroid	Calcitonin- regulates blood calcium and phosphate.
5.	Pancreas.	In the abdomen	Insulin- decreases blood glucose level. In case of under activity sugar level in the blood rises causing diabetes. These persons take insulin injections
6.	Adrenal glands(a pair)	Just above each kidney	Adrenaline- It acts on heart which beats faster to supply more oxygen to muscles. The breathing rate increases to enable the body to deal with the emergency situation It prepares us to meet any emergency.
7	A pair of ovaries in females	In the lower abdomen	Estrogen-Development of female sex organs and secondary sexual characteristics Progesterone- Release of ovum and maintaining pregnancy
8	A pair of testes in males	Out side the body in the scrotum	Testosterone-Development of male sex organs and secondary sexual characteristics

Feed back mechanism-

The timing and amount of hormones released are regulated by feed back mechanisms.e.g. If the sugar level increases it is detected by cells of pancreas so it releases more insulin to reduce the sugar level. As the sugar level becomes norma! less insulin is secreted.

Coordination in plants

Plants neither have a nervous system, nor muscles for control and coordination.
Plants show two types of movements in response to stimuli. They are-

a) Independent of growth or Nastic movements
b) Dependent on growth or Tropic movements

a) Independent of growth or nastic movements-These movements are nondirectional and reversible. They are triggered by the stimuli but do not depend on the direction of the stimulus. The plants also use electro-chemical means to convey this information from cell to cell although there are no specialized tissues for conduction of information. Some cells may undergo a change in shape to cause movements e.g. In touch-me-not plant the leaflets are sensitive to touch and fold as soon as they are touched. It happens due to rapid loss of water from specialized cells at the base of leaflets. When the plant is left undisturbed, it comes back to its original form in about 7 to 10 minutes.

b) Dependent on growth or Tropic movements-In these movements direction of stimulus determines the direction of response. They are irreversible growth movements which can be either towards the stimulus, or away from it.e.g. Pea plant climbs up other plants with the help of tendrils which are sensitive to touch. When thencome in contact with any support, the part in contact with the support does not grow as fast as the part away from support. So the tendrils coil round the solid support. Since the growth is direction, it appears
"as the plant is moving in a particular direction. Plants show tropic movements in response to stimuli like light, gravity, water and chemicals, i) Phototropism-Response of plant light. When a growing plant receives light from one direction the shoot bend towards light so it is positively phototropic but root bends away from light so it is negatively phototropic. Ii) Geotroplasm-Response induced by gravity. Roots grow towards gravity and show positive geotroplasm hut stem is negatively geotropic
Iii) hydrolroplasm -Response towards water, roots bend towards water iv) chemotropism-response of plant parts towards chemicals e.g. pollen tubes grow towards ovular in tho ovary due to chemicals •produced there.

Plant hormones or Phytohormones

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

i) Auxins- These hormones are synthesized in the shoot tip. When growing plant detects light from one side these hormones diffuse towards the other side of the shoot and the cells in it grow longer so stem bends towards light.

ii) Gibberellins-These hormones promote stem elongation, flowering, fruit development and bud germination.

iii) Cytokines- stimulate cell division and growth. They are present in areas of fast cell division like fruits and seeds.

Abscisic acid-It is a growth inhibitor. It brings about falling of leaves and fruits.