

Biology

NTSE Foundation

Control & Co-ordination

Introduction

All multicellular organisms consist of several organs and systems and they work in coordination with one another. Control and coordination also help to maintain a steady state within an organism in constantly changing environment. The mechanism of maintaining internal steady state is called homeostasis. It is the internal environment (physiologically) that adjust to the external stress of oxygen. E.g. Mammals are capable of maintaining a constant body temperature.

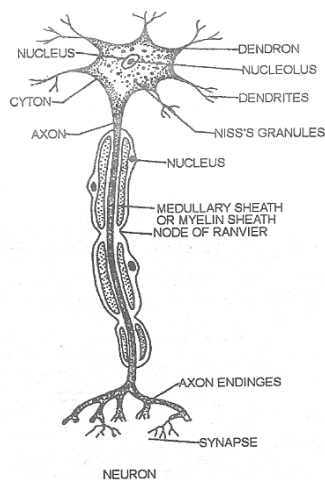
- Coordination in plants: Plants do not have a nervous system but they respond to the changes in environment by co-ordinating with other systems with the help of plant hormones. Plant hormones regulate growth and development. They are also known as growth regulators. Examples of plant hormones are auxins, gibberellins, cytokinins and abscisic acid.

Nervous Co-ordination in Animals

In animals two kinds of control & co-ordination (nervous & chemical) are present. The nervous co-ordination is brought about by the nervous system and the chemical co-ordination by hormones. Both the systems work as an integrated system. Infact such a control and coordination requires

- (i) gathering information about changes in the external environment.
- (ii) Transmitting this information to the internal cells located away from the body surface.

Nervous System In Human



The nervous system of human beings consists of central & peripheral nervous systems. Neuron is

the structure & functional unit of nervous system. It is the longest cell found in the body. They unite the receptor and effector organs with each other. The nervous system is composed of neurons. These are surrounded by a connective tissue called neuroglia. Impulses from receptors run through neurons. The number of neurons are almost fixed for a particular species.

(a) Structure:

Each neuron consists of cell body called cyton and a number of branches (nerve fibres) arising from the Cyton. Neuron does not divide. Cyton contains a nucleus within the cytoplasm & Nissl's Granules (formed of RER with ribosomes) and fine thread like fibres, called neurofibrils.

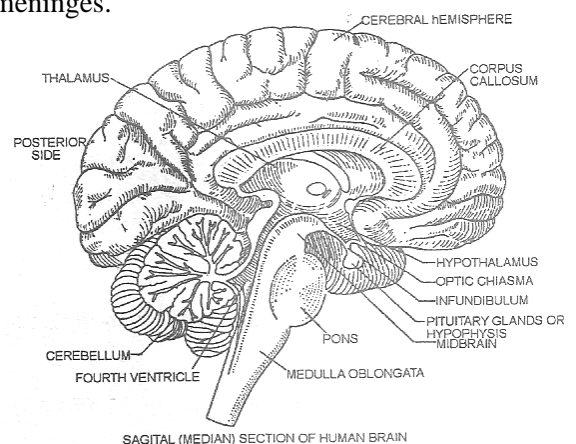
(i) Axon: It is a large, single and unbranched structure. It has no nissl's granules. It carries impulses from cyton to the effector organs like glands. Muscles etc. Synapse is a very fine gap between these two neurons. Thus, in the entire nervous system neurons are linked together.

(b) Types of Neurons or Nerve Fibres:

- (i) Motor: It carries impulses from brain and spinal cord to effector organs.
- (ii) Sensory: It transmits impulses from sensory organs to central nervous system.

(c) Types of Nervous System:

(i) Central nervous system: It consists of the brain and the spinal cord. The brain is covered by cranium & spinal cord is covered by vertebral column, both are also surrounded by three membranes of the connective tissues called meninges.



- Brain: It is situated in the head and protected by the skull. The brain consists of three main

parts-cerebrum, cerebellum and medulla. Different regions of the brain perform different functions.

- Cerebrum controls thought, memory, Perception, intelligence and speech. It forms the longest portion of the brain.
- Cerebellum controls the coordination activities and maintains body balance.
- Medulla controls the involuntary muscular activities of the heart, stomach, kidneys etc. It is the lower portion of the brain which narrows to form the spinal cord.
- Spinal cord: It is a long tubular structure that passes down the vertebral column. It carries messages from the various nerves and sends them to the brain. It also transfers the messages from the brain to all parts of the body.

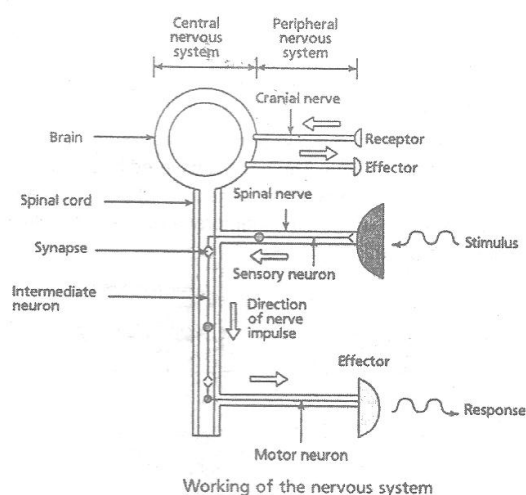
(ii) peripheral nervous system: It includes cranial nerves and spinal nerves. There are 12 pairs of cranial nerves in man and 31 pairs of spinal nerves arise from spinal cord.

(iii) Autonomic nervous system: It controls involuntary activities of internal organs such as heart, blood vessels, glands & smooth muscles of alimentary canal & uterus. It is subdivided into

- Sympathetic
- Parasympathetic system

Organs receive nerves from both sympathetic and parasympathetic nerve fibres. They have opposite effects on the organs if one is stimulatory, The other is inhibitory.

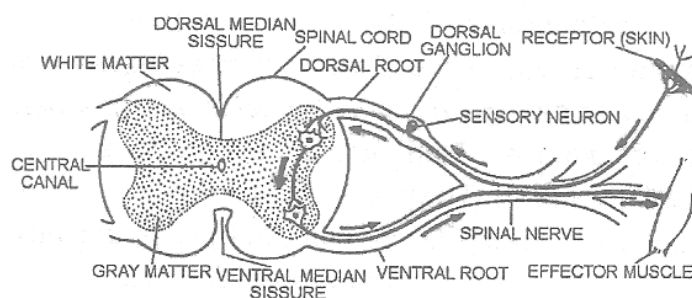
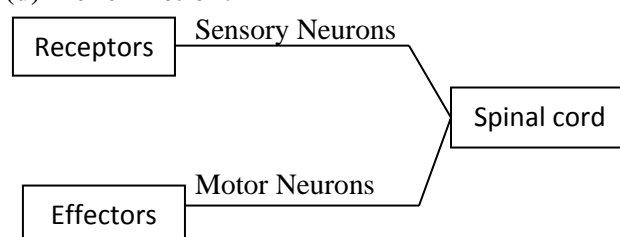
Working of the Nervous system



Our nervous system controls and coordinates different parts of the body.

- A receptor receives a stimulus and generates nerve impulses.
- Impulses are transmitted very rapidly to the central nervous system along the nerve fibre.
- Information is processed and intergrated in the central nervous system which the generates impulses which travel along the nerve fibre of motor neurons.
- The effector now brings about a response.

(d) Reflex Action:



T.S. OF SPINAL CORD AND ARROWS ARE SHOWING REFLEX ARC.

Reflex action is the name given to the resonse which is at the level of spinal cord itself. It is a rapid automatic resonse to a stimulus by an organ or a system of organs, which does not involve the brain for its initiation. A reflex action is an unconscious (without will) and involuntary response of effectors (muscles or glands) to a stimulus.

(e) Electro Encephalogram (EEG):

The activity of brain is recorded as electrical potentials such a record is called Electro Encephalogram (EEG). An instrument called electro encephalograph.

- Endocrine System: Glands made up of specialized tissues called endocrine glands, are found in our body. The special chemical substances 'homones' are secreted by these glands which catalyse and control various biological process. These glands secrete

hormones directly to the blood so these glands are also called ductless, glands. These glands are located in different parts of our body. Our main endocrine glands are as follows.

Gland	Hormone	Effect
Pituitary	Growth Hormone	Controls growth
Pituitary	Others	Controls other endocrine glands.
Thyroid	Throxine	Controls general metabolism.
Parathyroid	Parathormone	Controls calcium level in food.
Pancreas (islets of Langerhans)	Insulin	Controls blood glucose level.
Adrenal	Adrenaline	Causes excitement, increases blood pressure, hearbeat & respiration rate.
Testis	Testosterone	Promotes development of secondary sexual characters in males.
Ovary	Oestrogen	Promotes developmenmt of secondary sexual characters in females.

EXERCISE

- Hormones influence body parts for bringing about
 - Proper growth
 - Co- ordination
 - Proper functioning of body parts
 - All of the above
- Pituitary gland is known as master endocrine gland because it controls
 - Thyroid gland & hence regulates metabolism
 - Gonads as well as adrenal & hence regulate sex appearance & salt metabolism
 - Growth
 - Thyroid, gonads
- Deficiency of thyroxine/hypothyroidism in adults results in
 - Diabetes mellitus

- Diabetes insipidus
 - Myxodema
 - Exophthalmic goiter & adrenal
- What is the effect of thyroxine on BMR
 - Increase
 - decrease
 - Uncertain
 - no effect
 - Failure or reduced insulin production causes
 - Diabetes insipidus
 - Diabetes mellitus
 - both A and B
 - Cretinism
 - Cerebellum is a part of-
 - Fore brain
 - Mid brain
 - hind brain
 - none of these
 - Find out the correct seq . of a simple reflex
 - Brain → Spinal cord → Effector
 - Effector → CNS → Sensory Nerve → Receptor
 - Muscles → Spinal cord → Brain → Receptor
 - Receptor → Sensory Nerve → CNS → Effector
 - Lateral branches of neuron is called
 - Axon
 - cyton
 - Collateral
 - all of these
 - Nissl's body found in neuron are –
 - Made up of DNA
 - Made up of ribosomes & RER
 - Help in formation of neurofibrils
 - Mass of mitochondria
 - Which of the following process occurs only in animals-
 - Hormonal control
 - Respiration
 - Nervous control
 - Nutrition
 - Length of spinal cord in man is-
 - 100cm
 - 75cm
 - 45 cm
 - 30cm
 - Which part of brain is more developed in man-
 - Medulla
 - Cerebellum
 - Cerebrum
 - Pituitary
 - Cretinism is due to less secretion of –
 - Adrenal
 - thyroid
 - parathyroid
 - Pituitary
 - Diabetes is due to-
 - Hormonal deficiency
 - Sodium deficiency
 - Iodine deficiency
 - Enzyme deficiency
 - Brain stem is formed by the union of
 - Optic lobes

- (b) Cerebellum with optic lobes
- (c) Corpora striata
- (d) Mid brain, pons varolii and medulla oblongata

16. Amount of glucose is higher in urine of a person.

The reason is deficiency of hormone-

- (a) Thyroxine
- (b) Astrogen
- (c) Insulin
- (d) Adrenalin

17. Insulin is produced by

- (a) Stomach
- (b) Liver
- (c) Gall bladder
- (d) Pancreas

18. Which hormone when secreted increases heart beats-

- (a) Insulin
- (b) Adrenalin
- (c) Cortisone
- (d) Testosterone

ANSWER - KEY

CONTROL & CO-ORDINATION

Q.	1	2	3	4	5	6	7	8	9	10
A.	D	B	C	A	B	C	D	C	B	C
Q.	11	12	13	14	15	16	17	18		
A.	C	C	B	A	D	C	D	B		