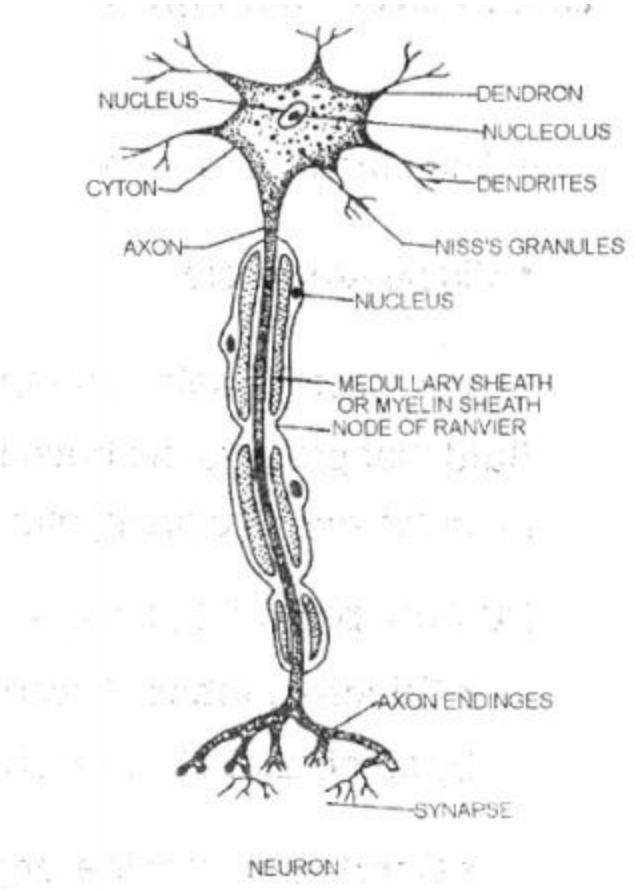
CONTROL & CO-ORDINATION

10.1 NERVOUS SYSTEM IN HUMAN :

The nervous system of human beings consists of central & peripheral nervous systems. Neuron is the structural & functional unit of nervous system. It is the longest cell found in the body. They unit 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 recptors run through neurons. The number of neurons are almost fixed for a particular species.



NEURON

10.1 (a) Struture :

Each neuron consist of a 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) Dendrites : These are short, several, much branched & contain granules. They carry impulse towards the cyton.

(ii) Axon : It is a large, single and unbranched structure. It has not nissl's granules. It carries impulses from cyton to the effector organs like glands, muscles etc. It is a typical nerve fibre consisting of a central thin cytoplasm cylindrical axis continuous with the body. It's cytoplasm is called **axoplasm.** Axis cylinder is enclosed in a thin permeable membrane called **axolemma** or nerve membrane. A layer of fatty material called myelin or medullary sheath is found outside the axolemma. Such fibres are called myelinated (medullated) fibres. They seems to be white. Nerve fibres lacking myelin sheath are called non-myelinated & appear grey in colour. Myelin in interrupted at intervals by circular constrictions called **Nodes of Ranvier.** Terminal branches of axon are called telodendria. Each telodendron ends in a swollen knob called **synaptic knob or terminal button.** Synaptic knob of one serve fibre (axon) forms synapse with the dendrites of another neuron. Synapse is a very fine gap between two neurons. Thus, in the entire nervous system neurons are linked together.

10.1 (b) Types of Neurons or Nerve Fibres :

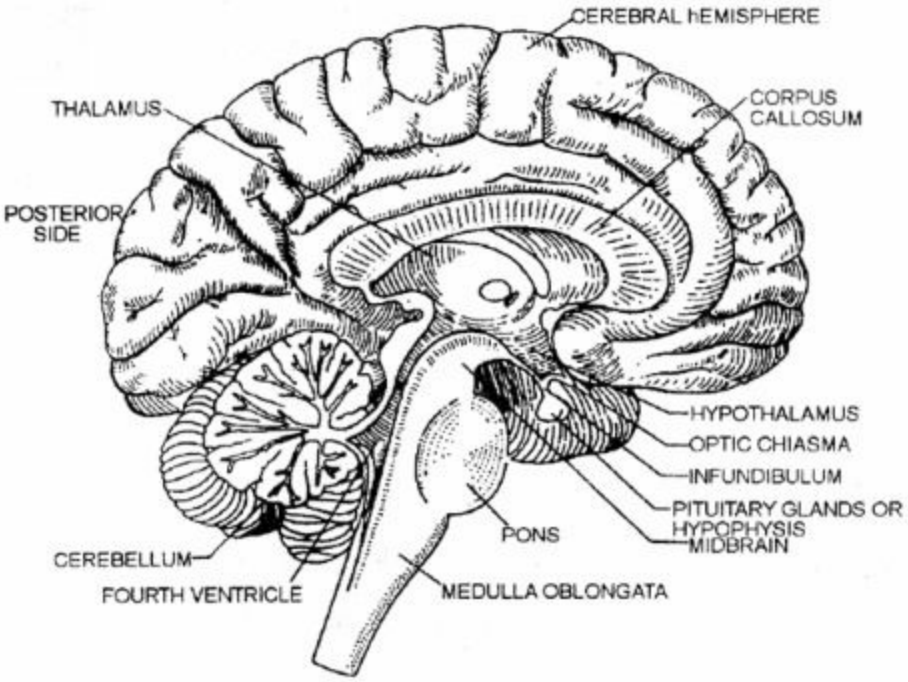
(i) Motor : It carries impulses from brain and spinal cord to effector organs.

(ii) Sensory : It transmits impulse from sensory organs to central nervous system.

10.1 (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.**



SAGITAL (MEDIAN) SECTION OF HUMAN BRAIN

• Outer most Duramater

• Middle Arachnoid

• Inner most Piamater. The space between the membrane is filled with a fluid called **cerebrospinal fluid** that protect the brain from mechanical shocks. The brain can be differentiated into three main regions fore brain, mid brain & hind brain.

(A) Fore brain : It consists of olfactory lobes, cerebrum and diencephalon.

• Olfactory lobes : These are a pair of small, solid, cube shaped bodies. They are fully covered by cerebrum. They receive impulse for smell.

• **Cerebrum :** It is the largest part of the brain. It consists of two cerebral hemispheres joined by a band of nerve fibres called corpus callosum. Surface of cerebral hemisphere is made up of gray metter, called cerebral cortex. It becomes highly folded to increase area for accommodation of more neurons. The folds are called gyri & depression between them, are called sulci. Deep and wide sulci are called fissures. Fissures divide each cerebral hemisphere into four lobes

(i) Occipital lobe : Region for visual perception

(ii) Frontal lobe : For muscular activities

(iii) Parietal lobe : For touch, smell, temperature and conscious association.

(iv) Temporal lobe : For auditory reception

Cerebrum has sensory areas where impulses are received from sense organs (receptors). Similarly it has a general motor area from where impulses are sent to effector organs (Muscles & glands)

• **Diencephalon :** It encloses a cavity called third ventricle. It consists of thalamus and hypothalamus. Thalamus serves as a relay centre for sensory and motor impulses from spinal cord and medullaoblongata to cerebrum. It recognizes sensory impulses of heat, cold, pain, light & pressure. Floor of third ventricle is called hypothalamus. It possesses control centres for hunger, thirst, thermoregulation, sleep, sex, stress etc.

(B) Mid Brain : It consists of two heavy fibre called **Crura cerebri.** These tracts connect fore brain to the hind brain. These are the centres for control of eye movement and hearing responses.

(C) Hind brain :

• **Cerebellum :** Very large & well developed. It controls coordination and adjustment of movements (equilibrium) and posture.

• **Pons varolii :** it lies above the medulla oblongata. It controls some aspects of respiration.

• **Medulla oblongata :** It is the posterior most part of the brain and continues into the spinal cord. It controls involuntary functions of the body such as heart beat, rate of breathing, secretion of saliva, swallowing, coughing, sneezing, vomiting etc.

• **Spinal Cord :** It lies in the vertebral column. It starts from medulla oblongata and extends downward. It is also protected by three meninges and cerebrospinal fluid. It also acts as a centre for spinal reflexes.

(ii) Peripheral nervous system : It included cranial nerves and spinal nerves. It mainly controls the voluntary activities of the body. Cranial nerves also called cerebral nerves arise from brain. 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 hear, blood vessels, glands & smooth muscles of alimentary canal & uterus. It is subdivided into

• Sympathetic

• Parasympathetic system.

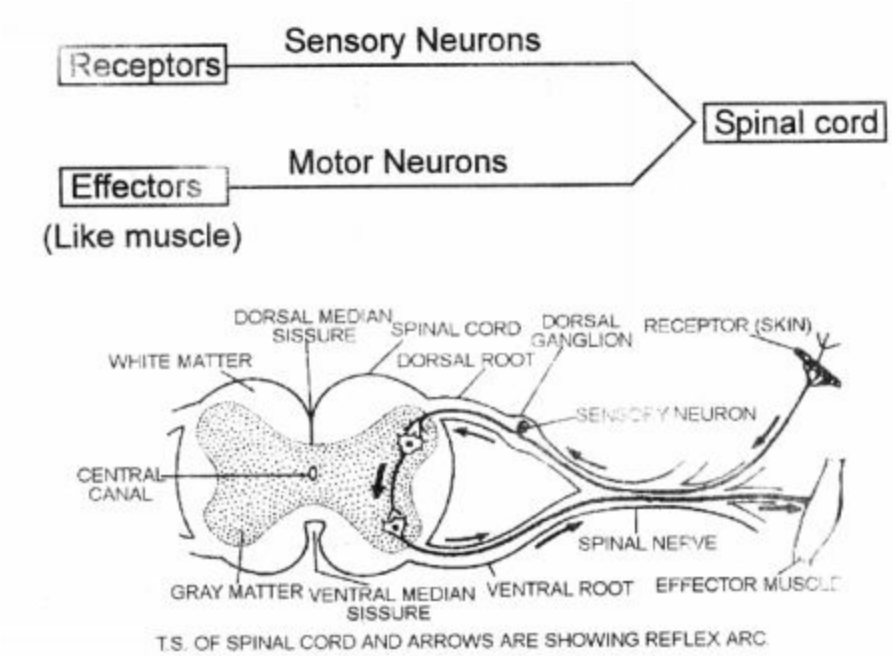
Organs receive nerves from both sympathetic and parasympathetic nerve fibres. They have opposite effects on the organs if one is stimulatory, the other is inhibitory.

10.1 (d) Effect of Sympathetic and Parasympathetic System :

Organ	Sympathetic System	Parasympathetic system
Heart	Increase heart beat	Decreases heart beat
Blood vessels	Constricts arteries & raises blood pressure.	Dilates arteries & lowers blood pressure
Brochi	Dilates bronchi making breathing easier	Constricts bronchi
Eye	Dilates pupil	Constricts pupil

Gastric secretion	Inhibits secretion	Stimulates secretion
Salivary glands	Inhibits secretion of saliva	Stimulates secretion
Urinary bladder	Relaxes urinary bladder	Contracts urinary bladder
Liver	Reduces bile secretion	Promotes bile secretion.

10.1 (e) Reflex Action :



Reflex action is the name given to the response which is at the level is spinal cord itself. It is a rapid automatic response 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.\

10.1 (f) Reflexes are of Two Types :

Simple or unconditioned and continued reflexes.

(i) Simple reflex : It is an inborn response to a stimulus. Where learning is not required. These are mostly protective in function **e.g.** knee jerk occurred immediately when patella tendon of leg is sharply

tapped, quick closing of eyelid when an object suddenly comes in fort of eyes (corneal reflex) etc.

(ii) Conditioned reflex : These are not inborn. They are acquired by experience, training & learning. **e.g. Learning of cycling or driving of scooter etc.**

10.1 (g) Electro Encephalogram (EEG) :

An instrument called electro encephalograph can record electrical activity of brain. The activity of brain is recorded as electrical potentials such a record is called Electro Encephalogram. By placing two electrodes on the scalp and leading via suitable amplifier to ink writing device, record of four different types of waves is obtained. These waves are named as alpha, beta, delta and theta and vary in frequency. These waves give the characteristic activity of brain which is very useful for clinical purposes.

DAILY PRACTICE PROBLES # 10

OBJECTIVE QUESTIONS

1. The effect of daily light period on flowering is called

(A) photooxidation (B) phototropism (C) photoperiodism (D) photorespiration

2. Brain stem is formed by the union of

(A) optic lobes (B) cerebellum with optic lobes

(C) corpora striate (D) mid brain, ponsvarolli and medulla oblongata

3. Number of spinal nerves in man are

(A) 11 pairs (B) 13 pairs (C) 6 pairs (D) 31 pairs

4. Third ventricle occurs in

(A) cerebrum (B) cerebellum (C) medulla oblongata (D) diencephalon

5. The pineal body is considered as

(A) an endocrine gland (B) an organ concerned with voluntary actions

(C) an organ concerned with vision (D) a vestige of third eye and endocrine gland

6. Part of brain involved in interpretation, storage of information and initiation of response on the basis of past experience is

(A) motor area (B) cerebellum (C) sensory area (D) association area

7. Autonomic nervous system controls

(A) reflex action (B) sense organs (C) internal organs (D) skeletal muscle

8. The study of nervous system and its disorders is called

(A) neurogenesis (B) hematology (C) neuroglia (D) neurology

9. In reflex action the reflex arc is formed by

(A) brain □ spinal cord □ muscles (B) receptor □ spinal cord □ muscles

(C) muscle □ receptor □ brain (D) muscles □ spinal cord □ receptor

10. The sensation of sight in human brain is perceived by

(A) optic lobe (B) occipital lobe (C) frontal lobe (D) parietal lobe

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SUBJECTIVE QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS

1. Systematically represent the path of a reflex action. From where it is

controlled ?

2. What are the functions of the following endocrine glands?

(i) Pancreas (ii) Thyroid (iii) Adrenal (iv) Ovaries (v) Tastes

3. Name the parts of endocrine system called as super master and master, also write their functions.

4. Write a short note on electroencephalography (EEG).

5. Write a short note on forebrain ?

6. Distinguish between cerebrum & cerebellum.

7. What are the functions of hindbrain ?

LONG ANSWER TYPE QUESTIONS

8. Write a short note a nerves. Also write about the different types of nerves found in human body.

9. What is hypothalamus ? Where it is situated? What are its main functions and secretions ?

10. Describe the structure of neuron with the help of a well lablled diagram.

11. Write down the source, site of action and functions of the following.

(i) Auxins (ii) Progesterone (iii) Thyroxin (iv) Ethylene (v) Insulin

12. Write a short note on secretory nature of.

(i) Pancreas (ii) Liver (iii) Testes (iv) Ovaries (v) Adrenals

13. Define ‘nerve impulse’. Which structure in neuron helps to conduct a nerve impulse ?

(i) Towards the cell body (ii) Away from the cell body **[CBSE, 2004]**