LESSON 3

BIOLOGICAL AND CULTURAL SHAPING OF MIND AND BEHAVIOUR

SUMMARY

The equipment with which we are born – the brain, nervous system and sensory – motor system is central to the functioning of organism.Our actions and bodily movements take place in an environment and are jointly determined by the socio-cultural environment and the nervous system.

We are born in a culture which is already in existence. As a result, the functioning of the system is often mediated by the socio-cultural environment.

Evolution, Heredity and Environment

The organisms existing today are outcomes of the process of evolution that has taken place in the course of a long span of time spanning over several million years.Charles Darwin gave the idea of "evolution" and theory of natural selection, where the focus is on the adaptation. Adaptation here implies, traits and behaviours which enable an organism to survive are retained and others are extinguished i.e., Survival of the fittest. Features that distinguish human beings from other species are –

Bipedalism: It indicates the ability to walk upright.

Encephalization: indicates increase in brain size and proportion of specialized brain tissues.

Development of language: effective communication and cultural achievement of human beings.

Heredity, refers to the genetic endowment that a human body inherits from his/her parents. It is often known as a biological blueprint.A person's genetic potential or genetic code interacts with the environment to influence and shape the pattern of behaviour.

Cells as the basic unit of life

Each living being whether it be a plant, animal or human being, is made up of these small units, called cells. There are certain differences between the cells of different living beings as well as the cells in the different parts of a living organism.

All cells contain a fluid called cytoplasm and a nucleus, and are enclosed in a cell membrane. Operations within the cells and the coordination among various cells make life possible.

The Neuron

These nerve cells collect information from the environment by means of receptors and then

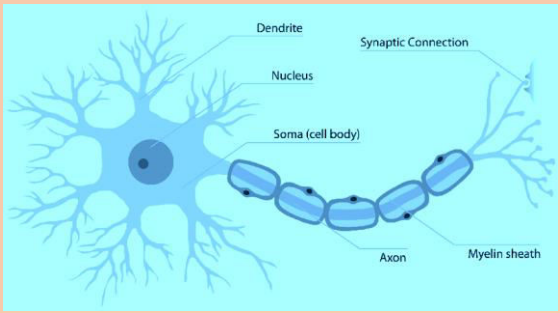
combine the information as well as make the action possible. The neurons also store information and lead to behaviour.Neurons make up half of the volume of the brain. Glial cells constitute the other half of the nervous system. Glial cells maintain homeostasis, form myelin, and provide support and protection to neurons.

Neurons in the nervous system are of various types but they all share certain common features such as - a cell body (soma), dendrites and axon.

Cell body–it regulates and controls the metabolism and maintenance of the entire cell.

Dendrites - neurons receive much of their input through dendrites via synaptic connection from other neurons.

Axon – it sends signals to the dendrites, other neurons or to muscles and glands.



Nerve Impulse: An information is carried through a series of electrical impulses that travel from one neuron to another. These are called nerve impulses.

Synapse: The regions where impulses cross from one neuron to the other are called synapses.

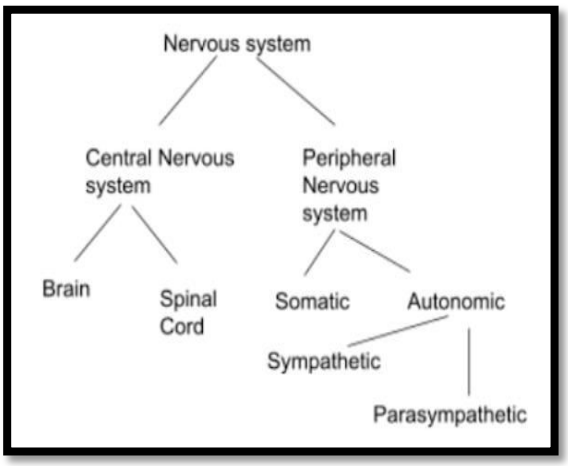
Types of Neuron

Motor neurons:the motor neurons carry out the orders of the brain for muscular movements such as chewing, walking, writing and so on which are under our conscious control. The reflex actions are mediated by the spinal cord. Breathing and eye blinking are involuntary actions. These involuntary actions are controlled by motor neurons.

Receptor neurons: Receptor neurons bring information into the nervous system. Such information is brought through senses.

Nervous System

The nervous system is made up of billions of neurons. It is responsible for receiving, processing and sending of information. All the functions of the body are controlled by the nervous system. Flow chart below describes the division of nervous system:



The **Central Nervous System** is responsible for sending nerve impulses and receiving the sensory information.

The **Peripheral Nervous System** consists of the group of neurons which transmit information between the CNS and the rest of the body. It is further divided into two parts:

Somatic Nervous system: it connects the brain and spinal cord with voluntary muscles of the body. This system senses and acts upon the external world.

Autonomic Nervous system: it controls the involuntary actions in the body such as those performed by heart, stomach and liver. It is composed of the sympathetic and parasympathetic systems.

The Central Nervous system (CNS)

The central nervous systemconsists of the brain and the spinal cord.

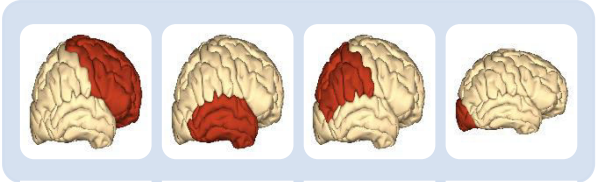
The Spinal Cord can produce reflex action and also act as a relay station.It has two major components, namely Gray matter and White matter.

The Brain is the primary part of the CNS. The brain is connected to the upper end ofthe spinal cord. The major structures of brain are as follows;

Brain	Cerebrum
	Cerebellum
	Brain Stem: medulla oblongata, midbrain, pons

Brain is divided into two hemisphere – left and right. Each hemisphere processes information about the opposite side of the body. The brain has two basic functions: cognitive functions (learning, memory, thinking, etc.) and the regulation of physiology of the body.

Cerebral Cortex - It is the uppermost layer of the brain. The cortex consists of a thick layer of densely packed neurons.it is divided into four lobes;



Frontal - functions such problem solving and planning	Temporal - receives auditory information	Parietal - receives information from body senses	Occipital - receives visual information

The Endocrine System

This system is a collection of ductless glands that controls various body functions.The endocrine glands secrete chemicals that send signals by releasing hormones directly into the bloodstream. The endocrine glands and their major functions are shown in the Box;

Gland	Function
Pituitary	Growth metabolism (transformation of food into energy) (Master gland); regulation of adrenal, thyroid, and gonadal hormone secretion; milk

	production in females.
Thyroid	control of growth, energy level and our mood
Adrenal	Adaptation to prolonged stress
Pancreas	Control of blood sugar level
Gonads	Reproduction, primary and secondary sex characteristics; sex drive

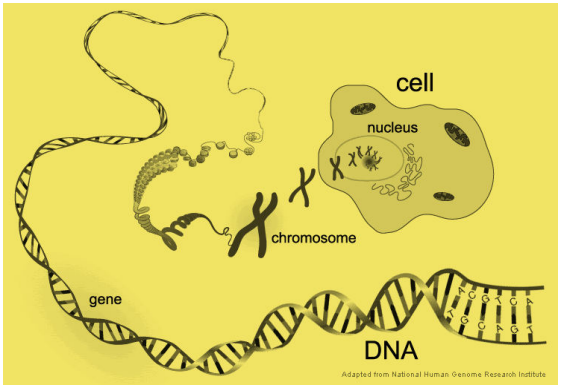
In both sexes (male and female) these hormones not only control the sex drive, but also regulate the development of secondary sex characteristics, like beards in men and breasts in women.

The androgens (such as testosterone) are generally found at higher levels in males than in females, while the oestrogens (such as oestradiol) are generally found at higher levels in females. Both classes are found in both sexes.

Genetic Influences on Behaviour

The branch of biology that deals with how heredity works is called **genetics**.**Behavioural genetics** is the study of inheritance of behavioural characteristics.An organism's physical appearance and behaviour varies from individual to individual.The former is known as **genotype** and the later are termed as **phenotype**.Every individual's phenotype is the result of the interaction between its genotype and the environment.

It is largely believed that the genetic characteristics transmitted by genetic factors set limits on the capabilities of organisms.The present genetic theory is based upon the work of **Gregory Mendel**. He showed that the characteristics of parents are passed on to their offspring through genes.



The process of inheritance is based upon the process in which the offspring receives one of each gene pair from each parent. Some genes are **dominant** and some are **recessive**.

The scientists working in the area of genetic engineering are trying to find out the genetic code so as to manipulate the cell structure. The aim is to solve the problem of genetically transmitted diseases or behavioural abnormalities.

Culture and Behaviour

Behaviour of human beings becomes meaningful in their cultural context.The patterns of behaviour found in different cultures emerge in the context of interactions of the people which are encoded in different forms.

Culture is said to represent what is contributed by human beings. It has subjective as well as

material aspects.Cultures do not remain static. While each culture tries to maintain its identity, it also interacts with other cultures and is influenced by them. Thus, there is both continuity and as well as change.

The Process of Socialization and Acculturation

Socialization is the process through which cultures are maintained and transmitted across generations.

The process of **Acculturation** deals with the influence of a new or different culture on a given culture.Acculturation is often found quite stressful and people respond to **acculturative stress** in different ways.

One may assimilate with the new culture or maintain a separate identity. Also, a new kind of integration may emerge which will involve the elements of old as well as new culture.

Do you know?

The human brain consists of approximately 150 billion nerve cells called neurons

An adult human brain weighs between 1250-1400 grams and neurons make up half of the volume of the brain.

Evaluate yourself

1. Explain the structure of nervous system and its functioning.
2. Describe the structure of brain and its functions.
3. Describe the functions of major glands of endocrine system.
4. Compare the differences between socialization and acculturation.