Biological Basis of Behaviour

Neurons: Neuron is the basic unit of our nervous system. Neurons are specialised cells, which possess the unique property of converting various form of stimuli into electrical impulsis. They are also especialised for reception, conduction and transmission of information in the form of electrochemical signals. They receive informations from sese organs or from other adjacent neurons, carry them to the CNS (brain & spinal cord), and bring motor information from CNS to the motor organs (muscles & glands).

Nearly 12 billion (1,200 crores) neurons found in the human nervous system. They are of many types and vary considerably in shape, size, chemical composition, and function. Despite these differences, they share in common three fundamental components; i.e. soma, dendrites, and axon.

(a) **Soma:** The soma or cell body is the main body of the nerve cell. It contains the nucleus of the cell as wellas other structures common to living cells of all types. The genetic material of the neuron is

stored inside the nucleus and it becomes actively engaged during cell reproduction and protein synthesis. The soma also contains most of the cytoplasm (cell fluid) of the neuron.

(b) Dendrites: Dedrites are the branch-like specialised structures emanating from the soma. They are the receiving ends of a neuron. Their function is to receive the incoming neural impulses from adjacent neurons or directly from the sense organs. On dendrites are found specialised receptors, which become active when a signal arrives in electro chemical or biochemical form. The received signals are passed on to soma and then to axon so that the information is relayed to another neuron or to muscles. The axon conducts the information along its length, which can be several feet in the spinal cord and less than a millimeter in the brain. At the terminal point the axon branches into small structures, called terminal buttons. These buttons have the capability for transmitting information to another neuron, muscle, and gland. Neurons generally conduct information in one direction, i.e. from the dendrites through soma and axon to the terminal buttons.

(c) Axons: The conduction of information from one plance to another in the nervous system is done through nerves, which are bundles of axons. Nerves are mainly of two types: sensory and motor.

(i) Sensory Nerves: It also called afferent nerves, carry information from sense organs to CNS.

(ii) Motor Nerves: It also called efferent nerves, carry information from CNS to muscles or glands. A motor nerve conducts neural commands which direct, control, and regulates our movements and other responses.

There are some mixed nerves also, but sensory and motor fibers in these nerves are separate.

Nerve Impulse: Information travels within the nervous system in the form of a nerve impulse. When stimulus energy comes into contact with receptors, electrical changes in the nerve potential start. Nerve potential is a sudden change in the electrical potential of the surface of a neuron. When the stimulus energy is relatively weak,

the electrical changes are so small that the nerve impulse is not generated, and we don't feel that stimulus. If the stimulus energy is relatively strong, electrical impulses are generated and conducted towards the CNS. The strength of the ~~stimulus that~~ nerve impulse, however, doesn't depend on the strength of the stimulus that started the impulse. The nerve fibers work according to the "all or none principle" which means that they either respond completely or don't respond at all. The strength of the nerve impulse remains constant along the nerve fiber.

Synapse: Information is transmitted from one place to another within the nervous system in the form of a neural impulse. A single neuron can carry a neural impulse up to a distance covered by the length of its axon. When the impulse is to be conducted to a distant part of the body, a number of neurons participate in the process. In this process one neuron faithfully relays the information to a neighboring neuron. The axon tip of a preceding neuron make functional connections or synapse with dendrites of the other neuron. A neuron is

never physically connected with another neuron; rather there is a small gap between the two. This gap is known as "synaptic cleft." The neural impulse from one neuron is transmitted by a complex synaptic transmission process to another neuron. The conduction of neural impulse in the axon is electrochemical, while the nature of synaptic transmission is chemical. The chemical substances are known as neurotransmitters.

Neurotransmitters: Neurotransmitters are endogenous chemicals that enable neurotransmission. It is a type of chemical messanger which transmits signals across a chemical synapse, such as a neuromuscular junction, from one neuron (nerve cell) to another 'target' neuron, muscle cell, or gland cell. Neurotransmitters are released from synaptic vesicles in synapses into the synaptic cleft, where they are received by neurotransmitter receptors on the target cells.