

Animals → Nervous system

- In animals two kinds of co-ordination - nervous and 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. In fact such a control and co-ordination require
 - Gathering information about change in the external environment
 - Transmitting this information to internal cells located away from the body surface
 - Exchange of information between the cells situated away from each other.

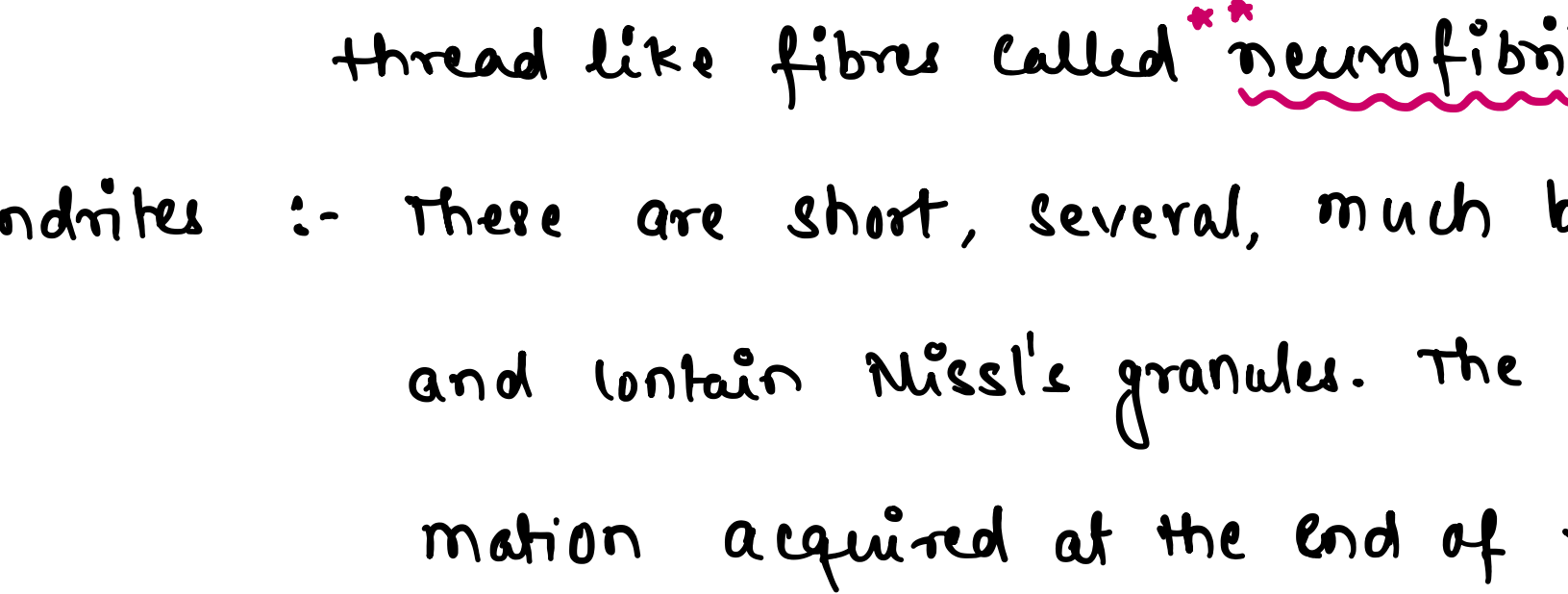
* Except sponges, all multicellular animals possess simple or complex nervous system. In all these animals, nervous system is comprised of specialised cells called neurons or nerve cells.

* Neurons :- structural and functional unit of nervous system.

* Nervous system :- It is composed of neurons and neuroglia (supporting connective tissue).

* Structure of Neuron :-

A neuron consists of main cell body and cytoplasmic processes arising from it



Cyton :- Cell body or soma contains nucleus with in cytoplasm and Nissl's granule

(formed of Ribosomes and RER) and fine thread like fibres called neurofibrils

Dendrites :- These are short, several, much branched and contain Nissl's granules. The information acquired at the end of the dendritic tip of the nerve cell. They carry impulse towards the cyton

Axon :- It is a large, single and unbranched structure. It has no Nissl's granules.

It carries impulse away from cytons to the effector organs like glands & muscles

The axon ends in a group of branches, the axon terminals (Nerve endings). When

axon terminal meet the dendrites of another neuron to form synapse they form synaptic knobs (= end plates). The synaptic knob contains mitochondria and secretory vesicles. The part

of sarcolemma that lies beneath the axon terminal is called motor end plate & junction

btw nerve ending & muscle is called neuromuscular junction.

Type of Neurons:-

(i) Motor - It carries impulses from brain & spinal cord to effector organs

(ii) Sensory - It transmits impulse from sensory organ to central nervous system.

General scheme of how nerve impulses travel in the body

- All information from our environment is detected or acquired at the end of dendritic tip of a

some nerve cell. These tips act as receptors usually located in our sense organs (eg. inner ear, nose, tongue etc.)

- This acquired information sets off a chemical reaction that creates an electrical impulse.

- This impulse travels from the dendrites to cell body, and then along the axon to its end.

- At the end of axon, the electrical impulse sets off the release of some chemicals.

- These chemicals cross the gap or synapse, and start a similar electrical impulse in a dendrite of the next neuron.

- A similar synapse finally allows delivery of such impulses from neuron to other cells, such as muscle cells or glands.

Synapse → It is the junction between two neurons.

Reflex Action :-

- It is a rapid automatic response to a stimulus by an organ or system of organs, without thinking about it.

- It is an unconscious (without will) and involuntary response of effectors (muscle or glands) to a stimulus.

- 'Reflex' is a word we use very commonly when we talk about some sudden action in response to something in the environment

- It is spontaneous mechanical response to a stimulus without the will of the animal

Reflex arc :- It is a basic functional unit of reflex action

• Impulse travels a path during reflex action, which is called reflex arc

• For reflex action five things are normally essential

(i) receptor (ii) sensory nerve = Afferent nerve fibre

(iii) a part of the central nervous system

(iv) motor nerve fibre

(v) effector organ such as muscles and glands.

MR - Reflex arcs have evolved in animals because the thinking process of the brain is not fast enough.

- In fact many animals have very little or none of the complex neuron network needed for thinking. So it is quite likely that reflex arcs have evolved as efficient way of functioning in the absence of true thought processes. However, even after

complex neuron networks have come into existence, reflex arcs continue to be more efficient for quick responses.

Examples of reflex actions

(1) closing of eyes when strong light is flashed across them.

(2) withdrawal of limbs when they are touched by hot things

(3) watering of mouth on seeing favourite food

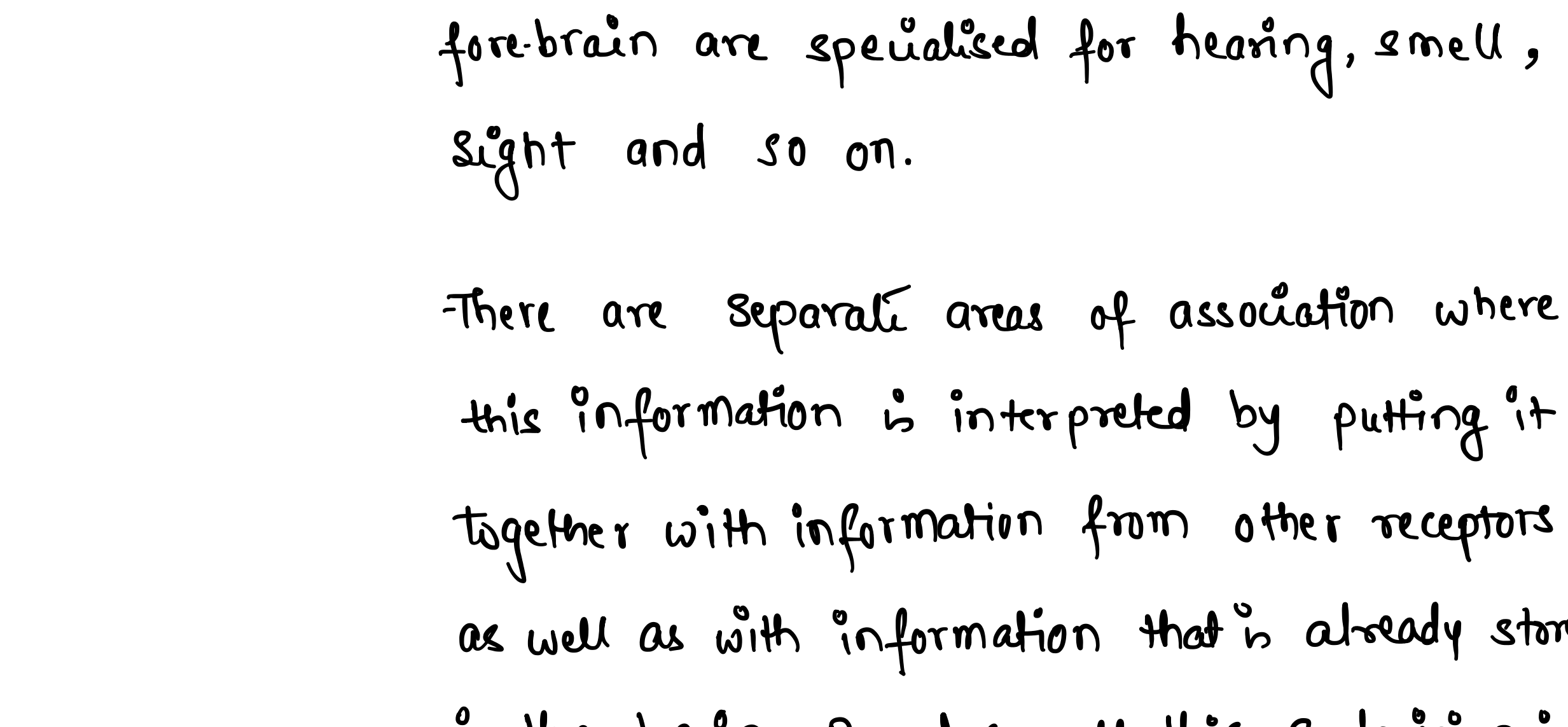
(4) Typing, riding a bicycle, swimming, dancing etc.

Type of reflex action → Reflex actions are broadly divided into two categories.

(i) unconditioned reflexes - They are inborn reflexes and transmitted through heredity.

eg. Blinking of eyes

(ii) Conditioned Reflex :- They are acquired reflexes. They are not constant they may disappear and reappear again.



fore brain - It is the main thinking part of the brain. It has regions which receive sensory impulses from various receptors. Separate areas of the fore-brain are specialised for hearing, smell, sight and so on.

There are separate areas of association where this information is interpreted by putting it together with information from other receptors as well as with information that is already stored in the brain. Based on all this, a decision is

made about how to respond, and the information passed on to the motor areas which control the movement of voluntary muscles for example

our leg muscles.

- The sensation of feeling of fullness is because of a centre associated with hunger, which is

in a separate part of the fore-brain (Hypothalamus)

Mid brain - It connects fore-brain with hind-brain. Many of involuntary actions are controlled by mid-brain and hind-brain.

Hind-Brain - It is made up of Pons, Medulla oblongata and cerebellum.

- Blood pressure, salivation, vomiting are controlled by the medulla of hind-brain.

- Cerebellum is responsible for precision of voluntary actions and maintaining the posture and balance of the body.

Example of voluntary action:-

• walking in straight line

• riding a bicycle

• Picking up a pencil.

- Brain is protected by bony-box called skull or cranium. Inside box, the brain is contained in a fluid filled

balloon (that fluid is cerebrospinal fluid) which provides further shock absorption.

- Spinal cord is protected by backbone or vertebral column.

How does the nervous tissue cause action?

• Processed information from CNS sends to muscle. When nerve impulse reaches the muscle, the muscle fibre must

move

• Muscle cells move by changing their shape.

• Muscle cells have special proteins that change both their shape and their arrangement in the cell

in response to nervous electrical impulse. When this

happens, new arrangement of these proteins give the

muscle cells a shorter form.