The nervous system and the endocrine system

organisms must respond to internal and external enviromental changes for survival

organisms may respond to enviromental changes using either the **nervous system** or the **endocrine system**

the nervous system
- uses electrical impulses sent through neurons
- transfer signals locally between synapses using neurotransmitters such as acetylcholine

the endocrine system
- uses hormones sent through the blood stream
- transfer signals aross large distances

thse communications (function of cells, organs and system) must be coordinated to operate effectively and maintain homeostasis

Neurons

A **neuron** is a specialised cell in the nervous system that is the basic building block of the brain, spinal cord, and nerves. Neurons are responsible for transmitting information through electrical and chemical signals, allowing the body to respond to stimuli.

structure of the neuron

feature	structure	function
soma	- the soma is the body of the cell which contains the nucleus surrounded by cytoplasm with lots of ER and mitochondria	synthesise neurotransmitters
dendron	- short extentions coming from the soma which branch out into dendrites	transmit electrical impulses towards the soma
axon	- single elongated nerve fibres that vary in length - narrow region of the cytoplasm surrounded by plasma membrane	transmit electrical impulses away from the soma
myelinated sheath	- the myelinated sheath is made of schwann cells which are lipids and is sometimes found wrapped about 20 times around the dendron and axon	used for electrical insulation of the neuron allows the electrical impuls to trasnmit faster as it can perform slatatory conduction
nodes of ranvier	- gaps between the schwann cells	areas that arent electrically insulated so the electrical impulse can jump from node to node

there are 3 types of neuron...

1. sensory neuron
- the sensory neuron carries the action potntial from the sensory receptor to the relay neuron in the CNS (brain and spinal cord)
- the sensory neuron has the soma in the middle between the dendron and axon.
- the sensory neuron has a dendron

2. motor neuron
- the motor neuron carries the action potential from the relay neuron in the CNS to the effector (muscle or gland)
- the motor neuron has the soma at the end of the neuron
- the motor neuron has no dendron - the dendrites connect directly to the soma

Neurons (cont)

3. relay neuron
- the relay neuron is found in the CNS an carries the action potential from the sensory neuron to the motor neuron

saltatory conduction

only some neurons have myleinated sheaths. the neurons which do are used for rapid rections because they can then peform saltatory conduction - saltatory conduction is the process by which the electrical impulse jumps from node to node to produce a quick reaction as the elctrical impulse doesn't have to pass through the whole neuron. unmyelinated neurons are used for rsponses that don't have to be immediate such as digestion.

other fators that affect the speed of action potentials are...

factor	why?
axon diameter	wider axons cause faster action potential since there is less resitance of flow for ions
temperature	as temperature increases ions diffuse faster meaning that the action potential is faster

coordination in animals

internal changes may include
- core temperature
- blood glucose concentration
- water potential
- cell pH

external changes may include
- environmental temperature
- touching something hot
- light intensity

the importance of coordination in animals

the communications (function of cells, organs and system) must be coordinated to operate effectively and maintain homeostasis

coordination in plants

plants dont have a nervous system however, they still must respond to changes in internal and external enviromental changes so therefore, they must communicate with hormones

internal changes may include
- water potential of cells

nutrient levels

external changes may include
- water availability
- nutrient availability
- soil pH
- light intensity
- temperature
- oxygen levels