



LO: State the relationship between receptors, the central nervous system and the effectors

- <u>Receptor or sense organs</u> detect <u>stimulus</u> and is <u>stimulated</u>, <u>generating nerve</u> <u>impulses</u>.
- <u>Sensory neurone</u> transmits nerve impulses to the <u>relay neurone</u> in the <u>central</u> <u>nervous system (CNS)</u> which consists of the <u>brain/spinal cord.</u>
- Before transmitting nerve impulses along the <u>motor neurone</u> to the <u>effector</u> (muscles/ glands) to carry out the response.

LO: State that the nervous system – brain, spinal cord and nerves, serves to co-ordinate and regulate bodily functions





LO: Outline the functions of sensory neurones, relay neurones and motor neurones

- <u>Neurones</u> are nerve cells that function to <u>transmit nerve impulses</u> within the nervous system.
- Neurones differ in <u>shapes</u> and <u>sizes</u>.
- Basic components of a neurone:
 - Soma <u>cell body containing the nucleus and organelles</u>, where essential metabolic processes occur to maintain cell survival
 - Axon and Dendron <u>nerve fibres</u> which are strands of cytoplasm extending from the cell body that <u>transmit nerve impulses to other</u> <u>neurones or effectors</u>
 - <u>o</u> Dendrites <u>short-branched nerve fibres</u> that <u>convert chemical information</u> from other neurons or receptor cells into <u>electrical nerve impulses</u>



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Name:



Types of neurones



- Sensory neurones transmit <u>nerve impulses</u> from <u>receptors</u> to the <u>relay neurones</u> in the <u>spinal cord or brain</u>.
- Relay neurones in the CNS (<u>spinal cord/ brain</u>) receive nerve impulses from <u>sensory</u> <u>neurones</u> and transmit them along the CNS to the <u>motor neurones</u>.
- Motor neurones transmit nerve impulses <u>from the CNS</u> to the <u>effectors</u> (<u>muscles/glands</u>) for an action to occur.
- Synapse a junction or connection between two neurones (from an axon to a dendron) by chemical means through <u>neurotransmitters</u>



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LO: Discuss the function of the brain and spinal cord in producing a co-ordinated response as a result of a specific stimulus in a reflex action

- Reflex action is an immediate involuntary response to a specific stimulus without conscious control.
- Reflex arc is the <u>shortest pathway</u> by which nerve impulses are transmitted from the receptor to the effector. The nerve impulses generated by the receptor are transmitted along the <u>reflex arc</u>.
- Spinal cord and brain are known as the <u>reflex centres</u>.



Topic: Nervous System





Example of brain / cranial reflexes - pupil reflex

- Change in light intensity <u>stimulates photoreceptors on the retina</u> to <u>generate</u> <u>nerve impulses</u>.
- Nerve impulses will be transmitted along the <u>sensory neurone in the optic nerve</u> across a synapse to the <u>relay neurone</u> in the <u>brain</u> and <u>across another synapse</u> to the <u>motor neurone</u> and to the <u>effector</u> which is the <u>muscles of the iris</u>.
- The circular and radial muscles of the iris contract and relax (or vice versa) to bring about the constriction and dilation of the pupil.

Example of spinal reflex - Knee Jerk (no relay neurone involved):

- Tap <u>stimulates</u> the <u>tendon</u> under the kneecap.
- <u>Nerve impulses are generated</u> and transmitted along the <u>sensory neurone</u> to the <u>spinal</u> <u>cord</u> and <u>across a synapse</u> to the <u>motor neurone</u> and to the <u>effector (no relay neurone</u> <u>involved).</u>



Spinal reflex: knee-jerk reflex

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- Name: ____
- The <u>effector</u> is the <u>thigh muscles which contracts</u>, bringing about <u>a sudden</u> <u>kicking of the legs</u>.

Example of spinal reflex - touching a hot object

- Heat on the object <u>stimulates</u> the <u>thermoreceptors</u> in the skin.
- <u>Nerve impulses are generated and transmitted</u> <u>along the sensory neurone</u> to the <u>spinal cord</u>.
- Nerve impulses are transmitted <u>across a</u> <u>synapse</u> to the <u>relay neurone</u> in the <u>spinal cord</u> and then <u>across another synapse</u> to the <u>motor</u> <u>neurone</u>.
- Nerve impulses are transmitted along the motor <u>neurone</u> to the <u>effector</u> which is the <u>arm muscle</u> which <u>contracts</u>, bringing about a <u>sudden</u> <u>withdrawal of the hand</u>.
- <u>At the same time, a relay neurone from the</u> <u>spinal cord</u> will also transmit nerve impulses to the <u>brain</u> to bring about the <u>pain sensation</u>.

Example of voluntary action – picking up a hot pan voluntarily

- Nerve impulses are initiated and generated at the brain.
- Transmitted via the <u>relay neurone</u> to the <u>spinal cord</u>
- <u>Across a synapse</u> to the <u>motor neurone</u> and to the <u>effector</u> which is the arm muscles.
- Arm muscles contract and hand is withdrawn.







Compare reflex action and voluntary action:

Similarities Both involve the transmission of nerve impulses via electrical and chemical signals. Both involve motor neurones and effector muscles

Reflex	Voluntary
reflex action is initiated at the receptors	Voluntary action is initiated at the brain
reflex action requires a stimulus	Voluntary action does not need a stimulus
reflex action does require sensory neurone	Voluntary action does not require sensory neurone
reflex action is not under conscious control	Voluntary action is under conscious control
Immediate response	Not immediate response