

WJEC (Wales) Biology A-level

Topic 3.8 - The Nervous System

Definitions and Concepts

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Acetylcholine - A type of neurotransmitter that is used for communication between neurones.

Action potential - The temporary change in electrical potential across the membrane of an axon in response to the transmission of a nerve impulse.

All-or-nothing - A principle that states that all stimuli above a certain threshold value will generate the same size action potential, regardless of the strength of the stimulus.

Axon - A long fibre that conducts nerve impulses away from the cell body.

Axon terminals - Branched endings of an axon that approach the muscle fibre.

Cell body - The region of the neurone that contains the organelles, notably the nucleus and the rough endoplasmic reticulum.

Central canal - A cerebrospinal fluid-filled space that lies in the centre of grey matter.

Central nervous system (CNS) - The brain and spinal cord.

Cholinesterase - An enzyme responsible for the hydrolysis of acetylcholine in the postsynaptic neurone.

Dendrites - Short, branched extensions of the cell body that receive nerve impulses from other neurones.

Depolarisation: A sudden, temporary change in the membrane potential of a neurone in response to the transmission of a nerve impulse. The inside of the axon is less negative than the outside and the potential difference reaches approximately +40 millivolts (mV).

Dorsal root ganglion - A group of sensory neurone cell bodies in the dorsal root of a spinal nerve.

Effector - An organ, tissue, or cell that produces a response to a stimulus.

Grey matter - The darker tissue of the central nervous system which lies centrally and consists of relay and motor neurone cell bodies.

Hyperpolarisation - A decrease in the membrane potential of an axon (due to the opening of K^+ channels), so that it is even more negative than the resting potential.

Meninges - Three membranes that cover the brain and spinal cord: the pia mater, arachnoid mater, and dura mater.

Motor neurone - A neurone that carries nerve impulses from the CNS to the effectors via the ventral root.

Myelin sheath - An electrically insulating layer consisting of the membranes of Schwann cells. It increases the speed of nerve impulses.











Nerve impulse - A wave of depolarisation that travels across an axon membrane. It is self-propagating.

Nerve net - The simplest form of nervous system found in Cnidarians. It consists of interconnected nerve cells with short extensions allowing a response to a limited number of stimuli.

Neurotransmitters - Chemicals that are used for communication between neurones and their target cells. Neurotransmitters are stored in synaptic vesicles in the presynaptic neurone and released into the synaptic cleft.

Nodes of Ranvier - Gaps between adjacent Schwann cells in the myelin sheath at which action potentials can occur.

Organophosphates - Chemical substances that act as cholinesterase inhibitors, preventing the hydrolysis of acetylcholine in the postsynaptic neurone and resulting in continuous stimulation of the neurone. Organophosphates can be used as insecticides.

Oscilloscope trace - A trace showing the change in electrical potential across the membrane of an axon at each stage of an action potential.

Peripheral nervous system (PNS) - Pairs of nerves that originate from the CNS and carry nerve impulses into and out of the CNS.

Postsynaptic neurone - The neurone after the synapse which contains specific receptor proteins on its membrane, complementary to the neurotransmitter.

Presynaptic neurone - The neurone before the synapse which releases neurotransmitters from synaptic vesicles into the synaptic cleft.

Psychoactive drugs - Excitatory drugs (e.g. amphetamine) that stimulate the release of neurotransmitters such as noradrenaline.

Receptor - A specialised structure that detects a specific type of stimulus.

Reflex - A rapid, automatic response to a sensory stimulus by the body. It serves as a protective mechanism.

Reflex arc - The pathway of neurones involved in a reflex action:

stimulus \rightarrow receptor \rightarrow sensory \rightarrow relay \rightarrow motor \rightarrow effector \rightarrow response neurone neurone

Refractory period - The time period after an action potential during which further action potentials are prevented. This ensures that action potentials can only be propagated in one direction.

Relay neurone - A neurone located in the spinal cord that links the sensory neurone to the motor neurone.











Repolarisation - The re-establishment of the resting potential (-70 mV).

Resting potential - The potential difference across the cell membrane of a neurone at rest which is typically -70 millivolts (mV).

Saltatory propagation - The process by which a nerve impulse is propagated along a myelinated neurone. Depolarisation occurs at the nodes of Ranvier and action potentials jump from node to node, speeding up transmission.

Schwann cells - Cells that form the myelin sheath around nerve cells in the peripheral nervous system.

Sensory neurone - A neurone that carries nerve impulses from the receptors to the CNS via the dorsal root.

Sodium-potassium pump - A carrier protein found in the plasma membrane of an axon. It actively transports three sodium ions (Na⁺) out of the axon for every two potassium ions (K⁺) that it pumps into the axon.

Stimulus - A change in an organism's internal or external environment that can be detected.

Synapse - The junction between two nerve cells or a nerve cell and an effector.

Synaptic cleft - A small gap between neurones across which a nerve impulse is transmitted via neurotransmitters.

Synaptic end bulbs - The end of an axon that is bulbous shaped and contains synaptic vesicles filled with neurotransmitters.

Synaptic vesicles - Secretory vesicles located in the presynaptic neurone that store neurotransmitters. Upon fusion with the presynaptic membrane, their contents are released into the synaptic cleft.

White matter - The lighter tissue of the central nervous system which surrounds grey matter and consists of myelinated axons.





