

CAIE Biology A-level

Topic 15 - Control and Coordination

Definitions and Concepts

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

Actin - A type of protein filament found in myofibrils. It forms thin filaments consisting of two long twisted chains.

Actin-myosin binding site - A site on actin that is normally blocked by tropomyosin. During muscle contraction, it becomes exposed, allowing a myosin head to attach.

Actin-myosin crossbridge - The cross-bridge formed when a myosin head attaches to the myosin binding site on an actin filament.

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 principle - The principle that describes how any generator potential which reaches or exceeds the threshold potential will produce an action potential of equal magnitude.

Anisotropic (A) bands - The darker bands in a myofibril, which consist of overlapping actin and myosin filaments.

Antidiuretic hormone (ADH) - A hormone released from the posterior pituitary gland that increases the reabsorption of water in the kidney tubules.

Autonomic nervous system - A branch of the nervous system that carries nerve impulses to muscles and glands. It controls involuntary activities and has two divisions: the sympathetic nervous system and the parasympathetic nervous system.

Auxins - A class of plant hormones that control cell elongation, produce tropisms, prevent abscission, maintain apical dominance and stimulate the production of ethene.

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

Chemoreceptor cell - A specialised sensory receptor cell that transduces a chemical to produce a biological signal. Chemoreceptor cells are found on the tongue.

Cholinergic synapse - A synapse which uses the neurotransmitter acetylcholine.

Contraceptive pills - Hormonal pills which usually contain synthetic versions of oestrogen and progesterone to inhibit ovulation and prevent pregnancy.

Dendron - An extension from a nerve cell that carries impulses towards the cell body.

Endocrine system - A chemical messenger system. It consists of glands, which produce and secrete hormones into the bloodstream, and effectors.

Follicle stimulating hormone (FSH) - A hormone produced and secreted by the anterior pituitary gland which acts synergistically with LH. In females, it stimulates the growth of follicles in the ovary.



Gibberellins - Plant hormones that control stem elongation, trigger the growth of the pollen tube during fertilisation and stimulate the mobilisation of food storage reserves during seed germination.

Glucagon - A hormone secreted by alpha cells (α cells) of the Islets of Langerhans in the pancreas. It increases blood glucose concentration.

Hormones - Cell signalling molecules produced by endocrine glands and released into the blood. They travel to target cells and bind to specific receptors, initiating a response. The effects of hormones are usually long-lasting.

Hyperpolarisation - The drop in membrane potential below the resting potential after repolarization due to open potassium ion channels.

H-zone - The lighter region in the centre of each A band.

Insulin - A hormone secreted by beta cells (β cells) of the Islets of Langerhans in the pancreas that decreases blood glucose concentration.

Intermediate neurone - A neurone that links a sensory neurone to a motor neurone.

Isotropic (I) bands - The lighter bands in a myofibril which consist of actin filaments only.

Le allele - A dominant allele that codes for a functional enzyme in the gibberellin synthesis pathway. If a plant possesses the *Le* allele, gibberellin is active and the plant grows tall.

le allele - A recessive allele that codes for a non-functional enzyme in the gibberellin synthesis pathway. If *le* is homologously present the plant remains short.

Luteinizing hormone (LH) - A hormone produced and secreted by the anterior pituitary gland which acts synergistically with FSH. In females, it stimulates ovulation.

Menstrual cycle - The hormone-regulated cycle of changes in the ovaries and uterine lining in females.

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

Myelination - The formation of a myelin sheath around nerve cells by Schwann Cells.

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

Myofibrils - Tiny contractile muscle fibres which group together. Numerous myofibril bundles constitute muscles. Myofibrils consist of two protein filaments: actin and myosin.

Myosin - A type of protein filament found in myofibrils. It forms thick filaments, consisting of long tails with bulbous heads, positioned to the side.

Neuromuscular junction - An excitatory synapse formed between a motor neurone and a muscle fibre that uses the neurotransmitter, acetylcholine.



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

Resting potential - The potential difference across the cell membrane of a neurone at rest which is typically between -60 and -70 millivolts (mV).

Saltatory conduction - The setting up of localised circuits between nodes of Ranvier which allows for the rapid propagation of an action potential.

Sarcomere - Each repeating unit of striations between adjacent Z-lines.

Sarcoplasm - The cytoplasm shared by muscle fibres. It consists of a high concentration of mitochondria and endoplasmic reticulum.

Sarcoplasmic reticulum - A membrane-bound structure in muscle cells that stores calcium ions.

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.

Skeletal muscle - A voluntary muscle responsible for movement. It makes up the majority of body muscle and is attached to the skeleton by tendons.

Sliding filament model - The mechanism by which a muscle contracts. During contraction, myosin filaments pull actin filaments to the centre of the sarcomere. The actin filaments slide along the myosin filaments. The sarcomere is shortened and the muscle length is reduced.

Somatic nervous system - A branch of the nervous system that carries impulses to the skeletal muscles. It controls voluntary activities.

Stimulus - An internal or external change which triggers a response.

Striated muscle - Muscle tissue consisting of sarcomeres.

Sympathetic nervous system - A branch of the autonomic nervous system that is active under stressful conditions. It stimulates effectors, speeding up activity.

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

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.

Transverse system tubules (T-tubules) - Tubules which run through striated muscle fibres and transmit the action potential.

Tropism - The growth response of a plant to a directional stimulus.



Tropomyosin - A protein found in muscles that forms a fibrous strand wrapped around an actin filament.

Troponin - A protein which regulates the position of tropomyosin. When calcium ions bind to troponin, it changes conformation and causes tropomyosin to move.

Uterus - A female reproductive organ located between the bladder and the rectum. It is the site of fetal growth.

Venus fly trap - A plant which responds rapidly by snapping shut when hairs on the lobes of modified leaves are stimulated twice within 20 seconds.

Z-line - The line in the centre of each I band.

