

Definitions and Concepts for CAIE Biology IGCSE

Topic 14: Coordination and Response

*Definitions in **bold** are for supplement only*

Accommodation - The process by which the elastic lens changes its shape (with the aid of ciliary muscles and suspensory ligaments) to focus on near or distant objects. Light is focused onto the retina.

Adrenal glands - Endocrine glands located above the kidneys that produce adrenaline.

Adrenaline - A hormone produced by the adrenal glands that is involved in the 'fight or flight' response. It increases heart rate, breathing rate and widens the pupils. **Adrenaline also increases blood glucose concentration.**

Antagonistic muscles - Pairs of muscles that work in an opposing fashion e.g. circular and radial muscles.

Auxins - A group of plant hormones that stimulate growth in shoot tips. They are involved in plant tropisms.

Blind spot - The area at the back of the eye where the optic nerve exits the eye. It lacks receptor cells so cannot detect an image.

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

Ciliary muscle - A ring of smooth muscle that controls the shape of the lens.

Circular muscles - Muscles of the iris that are involved in the pupil reflex action. In bright light, the circular muscles contract to constrict the pupil. Less light enters the eye.

Cone cells - Cells found in the retina that are sensitive to high light intensity (bright light). There are three types of cone cells that can detect light of different colours.

Cornea - The transparent outer covering of the eye which refracts light entering the eye.

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

Endocrine glands - Glands of the endocrine system that secrete hormones directly into the bloodstream.

Endocrine system - A collection of glands that secrete hormones into the bloodstream. Transmission of signals is slow and the effects are long-lasting.



Fovea - A region of the retina with a high density of cone cells.

Glucagon - A hormone secreted by the pancreas when blood glucose concentration is too low. It causes the breakdown of glycogen to glucose in the liver.

Gravitropism - A plant's growth response to gravity.

Hair erector muscles - Tiny muscles found in the skin which contract causing hairs to stand erect.

Homeostasis - The maintenance of a stable internal environment in the body (**within set limits**) despite fluctuations in internal and external conditions.

Hormone - A cell signalling molecule produced by endocrine glands and released into the blood. It travels to a target organ and binds to receptors on effectors, initiating a response.

Hypothalamus - A structure in the brain that contains the thermoregulatory centre. It coordinates information from the receptors and sends instructions to the effectors.

Insulin - A hormone secreted by the pancreas when blood glucose concentration is too high. **It causes liver and muscle cells to increase their uptake of glucose and the conversion of glucose to glycogen in the liver.**

Involuntary action - An action that does not involve conscious thought. Also known as a reflex action.

Iris - A pigmented ring of circular and radial muscles. It controls the size of the pupil to alter how much light enters the eye.

Lens - The transparent structure at the front of the eye which refracts light, focusing it onto the retina. The lens is attached to a ring of ciliary muscle via suspensory ligaments.

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

Negative feedback - **A corrective mechanism that allows only small shifts from a set point, reversing a change in conditions.**

Negative plant tropism - The growth of a plant away from a stimulus.

Nerve impulse - An electrical signal that travels along neurones.

Nervous system - A collection of nerves and neurones involved in the transmission of electrical impulses. Transmission of signals is rapid and the effects are short-lived.

Neurone - A specialised cell that transmits nerve impulses. Also known as a nerve cell.

Neurotransmitter - **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.**



Oestrogen - A female sex hormone released by the ovaries that is involved in the development of the female secondary sexual characteristics. It also causes the growth and repair of the uterus lining during the menstrual cycle.

Optic nerve - A nerve at the back of the eye that transmits nerve impulses to the brain from the retina.

Ovaries - A pair of endocrine glands in females that secrete oestrogen into the bloodstream.

Pancreas - An endocrine gland situated behind the stomach that produces insulin.

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

Phototropism - A plant's growth response to light.

Plant tropism - The growth response of a plant to a stimulus.

Positive plant tropism - The growth of a plant towards a stimulus.

Pupil - The aperture of the iris through which light rays enter the eye.

Pupil reflex - A type of reflex action. The size of the pupil changes in response to exposure of the eye to different light intensities. **Pupil size is controlled by the antagonistic circular and radial muscles in the iris.**

Radial muscles - **Muscles of the iris that are involved in the pupil reflex action. In dim light, the radial muscles contract to dilate the pupil. More light enters the eye.**

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 → receptor → sensory → relay → motor → effector → response
 neurone neurone neurone

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

Retina - A specialised layer at the back of the eye composed of light receptors. It converts light energy into neural signals which are sent to the brain via the optic nerve.

Rod cells - **Cells in the retina that are sensitive to low light intensity (dim light).**

Sense organ - A group of specialised receptor cells that respond to certain stimuli. The five sense organs are the eyes, ears, nose, skin and tongue.



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

Shivering - The involuntary contraction of muscles which generates heat from respiration.

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

Suspensory ligaments - A series of fibres that attach the lens to a ring of ciliary muscle.

Sweat glands - Small tubular structures that secrete sweat onto the surface of the skin.

Sweating - The secretion of sweat onto the surface of the skin by sweat glands. The evaporation of water in sweat removes heat energy from the skin.

Synapse - The junction between two nerve cells or a nerve cell and an effector that ensures nerve impulses can travel in one direction only.

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

Synaptic vesicles - Secretory vesicles located in the presynaptic neurone that store neurotransmitters and release them into the synaptic cleft on arrival of a nerve impulse.

Testes - A pair of endocrine glands in males which secrete testosterone into the bloodstream.

Testosterone - A male sex hormone released by the testes that is involved in the development of the male secondary sexual characteristics.

Thermoregulatory centre - An area of the hypothalamus that regulates body temperature. It contains receptors sensitive to blood temperature.

Type 1 diabetes - A type of diabetes in which the pancreas fails to produce enough insulin. It is controlled using daily insulin injections, limiting refined sugar intake and getting regular exercise.

Vasoconstriction - Constriction of arterioles near the surface of the skin. Less blood flows close to the skin surface, decreasing heat loss to the surroundings.

Vasodilation - Dilation of arterioles near the surface of the skin. This allows blood to flow closer to the skin surface, increasing heat loss to the surroundings.

Voluntary action - An action that involves conscious thought.

