WJEC (Wales) Biology A-level

Option C - Neurobiology and Behaviour

Definitions and Concepts

Acetylcholine - A type of neurotransmitter that is used for communication between neurones. It is released by most parasympathetic neurones.

Adrenocorticotrophin - A hormone secreted by the pituitary gland that stimulates the release of cortisol from the adrenal glands.

Arcuate fasciculus - A nerve fibre bundle which links Broca's area and Wernicke's area.

Arginine vasopressin (ADH) - A hormone secreted by the hypothalamus that stimulates the release of adrenocorticotrophin from the pituitary gland.

Association areas - Areas of the cerebral cortex that receive information from sensory areas and relate this information to previous experiences. They initiate responses, sending impulses to the appropriate motor areas.

Autonomic nervous system - A branch of the motor 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.

Brain - The central organ of the human nervous system. It is divided into three main regions: the hindbrain, midbrain and forebrain.

Broca's area - The area of the cerebrum that has motor control over speech production.

Caste - A group of closely-related individuals within a social insect colony with a specific role e.g. finding food or defending the colony.

Cerebellum - The region of the brain that controls muscle coordination and non-voluntary movement (e.g. balance, posture).

Cerebral cortex - A highly folded layer of nerve cell bodies (grey matter) that surrounds the cerebrum. It is responsible for most conscious thoughts and actions and can be divided into sensory, motor and association areas.

Cerebrospinal fluid - A fluid found in the ventricles of the brain that supplies oxygen and nutrients to the neurones.

Cerebrum - The largest region of the brain, consisting of two hemispheres, that receives sensory information from receptors and sends information via the motor neurones to effectors. It is responsible for all voluntary behaviour, memory, personality, learning and reasoning.

Classical conditioning - A type of conditioning that involves the association of a natural stimulus with an artificial stimulus to induce the same response.

Communication - The transmission of information from one animal to another. This can occur in a variety of ways including by touch, pheromones and dances.

Computerised tomography (CT) - A medical imaging technique that uses specialised X-ray equipment and computer software to create detailed images of internal organs.

Conditioning - An associative behaviour in which a stimulus is linked to a particular response.

Corpus callosum - A bundle of nerve fibres that connects the cerebral hemispheres.

Corticotrophin-releasing hormone - A hormone secreted by the hypothalamus that stimulates the release of adrenocorticotropin from the pituitary gland.

Cortisol - A steroid hormone produced by the adrenal glands in response to stress. Adults who have experienced traumatic childhoods tend to have higher concentrations of cortisol, increasing their risk of mental illness.

Courtship - A set of behaviours exhibited by an animal to attract mates.

Developmental plasticity - The formation of new connections and pathways in the brain during development as a result of environmental changes and sensory stimulation.

Dominance hierarchy - A type of social hierarchy in which higher-ranking members dominate over lower-ranking individuals.

Electroencephalography (EEG) - An imaging technique in which electrodes positioned on the scalp are used to record changes in the electrical activity of different regions of the brain.

Epigenetics - The study of changes in gene expression that are not due to alterations in the nucleotide base sequence of DNA. Epigenetic changes are linked to brain diseases such as addiction and mental illness.

Fixed action pattern (FAP) - An instinctive behavioural sequence in response to a sign stimulus.

Forebrain - The region of the brain that consists of the hypothalamus, thalamus and cerebrum.

Frontal lobe - One of four divisions of each cerebral hemisphere that includes Broca's area and is involved in planning, decision making, problem solving, emotions, speech and movement.

Functional magnetic resonance imaging (fMRI) - A medical imaging technique that uses radio waves and a magnetic field to assess brain function through the visualisation of blood flow in brain capillaries.

Glucocorticoid receptors - Receptors on the hippocampus to which cortisol binds, inhibiting the hypothalamus.

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

Habituation - Learning to ignore a stimulus that is not followed by a reward or punishment.

Hindbrain - The region of the brain that includes the medulla oblongata and cerebrum.

Hippocampus - A structure in the brain that is involved in learning, memory, reasoning and personality.

Homunculus - A representation of a small human being that shows the relationship between the nerve supply of the different parts of the body and size of the region of the cerebrum responsible for it.

Hypothalamus - The region of the brain that serves as the control centre for the autonomic nervous system. It is responsible for hormone production, the regulation of the water potential of body fluids and the control of behavioural patterns.

Imitation - A form of learning in which an animal copies the behaviour of another animal (usually from the same species). This enables knowledge and behavioural traits to be passed down from generation to generation.

Imprinting - A form of learning in which a young animal attaches to the first large moving object it sees. This is reinforced by subsequent rewards such as food, warmth and protection.

Innate behaviour - A behaviour that is inherent in an organism.

Insight learning - A type of learning that occurs suddenly through the understanding of relationships between previously learned information. It does not result from trial and error learning.

Inter-sexual selection - A driving force of sexual selection in which males compete for sexual access to females. This is exhibited in African lions and southern elephant seals.

Intra-sexual selection - A driving force of sexual selection in which females choose between male mates.

Kinesis - A non-directional movement response to a stimulus in which the whole organism moves faster and changes direction, e.g. in response to a dry environment, woodlice move faster and change direction more often.

Latent learning - A type of learning that occurs in the absence of external reinforcement, e.g. learning information during the exploration of new surroundings.

Learned behaviour - A permanent change in an organism's behaviour as a result of experience.

Limbic system - A collection of brain structures (the hypothalamus, thalamus and hippocampus) that is involved in learning, memory and emotion.

Magnetic resonance imaging (MRI) - A medical imaging technique that uses radio waves and a magnetic field to produce images of internal body structures.

Medulla oblongata - The region of the brain that regulates autonomic activities such as ventilation, heart rate and peristalsis. It is made up of regulatory centres of the autonomic nervous system.

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

Midbrain - The region of the brain consisting of nerve fibres which link the forebrain to the hindbrain.

Motor areas - Areas of the brain that are involved in the control of voluntary movements. They send nerve impulses to effectors on the opposite side of the body via motor neurones.

Motor homunculus - A homunculus that represents the primary motor cortex. Highly innervated areas such as the muscles of the hands and face are depicted in an exaggerated fashion.

Negative feedback - A feedback mechanism that inhibits the original stimulus and reverses the change in conditions, restoring the optimum point.

Neuroplasticity - The ability of the brain to form new connections and pathways in response to environmental changes, disease, or injury.

Noradrenaline - A type of neurotransmitter that is used for communication between neurones. It is released by most sympathetic neurones and has similar effects to adrenaline.

Occipital lobe - One of four divisions of each cerebral hemisphere that serves as the visual processing centre.

Operant conditioning - A type of conditioning that involves the association of a behaviour with a reward or punishment.

Parasympathetic nervous system - A branch of the autonomic nervous system that is active under normal, resting conditions. It inhibits effectors, slowing down activity.

Parietal lobe - One of four divisions of each cerebral hemisphere. It processes sensory information and is concerned with orientation, movement, sensation and aspects of memory and recognition.

Positron emission tomography (PET) - A medical imaging technique used to assess organ and tissue metabolic function through the use of radioactive molecules and computer analysis.

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

Sensory areas - Areas of the brain that receive and process sensory information from receptors in the body.

Sensory homunculus - A homunculus that represents the primary somatosensory cortex. Highly innervated areas such as the tongue, lips and fingertips are depicted in an exaggerated fashion.

Sexual dimorphism - Differences in appearance between two sexes of the same species.

Sexual selection - A mode of natural selection that arises through the preference of one gender for particular characteristics in the other gender. It leads to more conspicuous characteristics.

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

Synaptic pruning - The elimination of unused synapses in the brain during development.

Taxis - A directional movement response to a stimulus, e.g. woodlice move away from a light source.

Temporal lobe - One of four divisions of each cerebral hemisphere that includes Wernicke's area and is involved with language, learning and memory.

Thalamus - A small structure located above the brainstem that sends and receives information to and from the cerebral cortex.

Ventricles (brain) - Four cavities inside the brain that are filled with cerebrospinal fluid.

Wernicke's area - The area of the brain that is responsible for the comprehension of written and spoken language.

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