

## Definitions and Concepts for Edexcel (A) Biology A-level

### Topic 7 - Run For Your Life

#### Topic 7 - Cardiac cycle and ventilation

**Accelerans nerve:** A sympathetic nerve which connects the medulla oblongata with the sinoatrial nerve and causes an increase in heart rate using the neurotransmitter noradrenaline.

**Atrioventricular node (AVN):** A group of cells found in the septum of the heart which receives the electrical impulse from the SAN and passes it down the bundles of His after a short delay.

**Bundles of His:** Bundles of heart muscle cells which carry the electrical impulse from the AVN to the Purkyne fibres.

**Cardiac output:** The total amount of blood that the heart pumps per minute which can be calculated using the following equation:

$$\text{Cardiac output} = \text{Stroke volume} \times \text{Heart rate}$$

**Cardiovascular control centre:** The region of the medulla oblongata which controls the heart rate and blood pressure through hormones and nerve impulses.

**Cardiovascular disease (CVD):** A term used to describe a group of diseases related to the heart and blood vessels.

**ECG:** A diagnostic tool used to measure the electrical activity of the heart which can aid the diagnosis of cardiovascular disease (CVD) and other heart conditions. †

**Medulla oblongata:** A region of the brainstem which controls involuntary actions such as heart rate and breathing.

**Myogenic:** A characteristic of cardiac muscle where it can initiate its own contractions without the need for nervous stimulation.

**Purkyne fibres:** Bundles of heart muscle cells carry the electrical impulse from the bundles of His upwards through the ventricles which causes contraction from the bottom up.

**Sinoatrial node (SAN):** A group of cells found in the right atrium of the heart that initiate the contraction of the cardiac muscle by regularly producing action potentials.



**Vagus nerve:** A parasympathetic nerve which connects the medulla oblongata with the sinoatrial nerve and causes a decrease in heart rate using the neurotransmitter acetylcholine.

**Ventilation centre:** The region of the medulla oblongata which controls automatic breathing.

## Topic 7 - Gene expression

**DNA profiling:** A method of comparing DNA sequences by cutting it into fragments and comparing the fragments with each other for genetic identification or determining genetic relationships.

**Exons:** Sections of genetic material which code for proteins.

**Forensic entomology:** The analysis of the insects found on decomposing tissue which is often used to determine the time of death.

**Gel electrophoresis:** A technique used to separate DNA fragments based on their size by their movement through a gel when an electric current is applied.

**Introns:** Sections of genetic material which do not code for proteins.

**Mature mRNA:** mRNA molecules after the removal of the intron sequences by the spliceosome.

**Polymerase chain reaction (PCR):** A laboratory technique used for the mass amplification of DNA using heat cycling and a heat resistant form of DNA polymerase.

**Pre-mRNA:** mRNA molecules before the removal of introns.

**Rigor Mortis:** The stiffening of the body caused by muscles contracting due to chemical changes a few hours after death.

**Spliceosomes:** A complex usually found in the nucleus which removes introns from transcribed mRNA molecules.

**Stage of succession (forensics):** Using knowledge of ecosystem development around a decomposing body to determine the rough time of death.

## Topic 7 - Homeostasis and exercise

**Homeostasis:** Maintaining a constant internal environment around an optimum despite external change.



**Hypothalamus:** The region of the brain located near the pituitary gland that is involved in homeostatic control including thermoregulation.

**Negative feedback:** The product of a process that counteracts change to maintain an equilibrium around a normal level.

**Positive feedback:** A process which causes an increase in change away from the normal level.

**Thermoregulation:** The homeostatic process of maintaining a constant body temperature.

**Vasoconstriction:** The narrowing of the blood vessels that supply capillaries at the skin surface to decrease heat loss to the environment which acts to maintain the core body temperature by keeping warm blood in central blood vessels.

**Vasodilation:** The widening of the blood vessels that supply capillaries at the skin surface to increase heat loss to the environment which results in a decrease in body temperature.

## Topic 7 - Muscles and movement

**A band:** The section of a sarcomere consisting of both actin and myosin filaments between the I band and the H zone.

**Actin:** A protein which makes up large filaments that play important roles in muscle contraction along with myosin.

**Adenosine triphosphate (ATP):** A molecule that acts as the energy currency of cells formed from a molecule of ribose, a molecule of adenine and three phosphate groups.

**Anabolic steroids:** A class of performance enhancing drug that is structurally similar to testosterone and used illegally by athletes to promote muscle growth.

**Antagonistic muscle pairs:** Two muscles which have opposing effects.

**ATPase:** A group of enzymes which catalyse ATP hydrolysis into ADP and inorganic phosphate ( $P_i$ ).

**Calcium ions ( $Ca^{2+}$ ):** A key inorganic ion found in biological systems that helps to strengthen bones and plays a crucial role in muscle contraction and nerve impulse transmission.

**Extensors:** A muscle which increases the angle at a joint and acts to extend a limb.

**Fast twitch muscle fibre:** A type of muscle fibre which can produce a short burst of strong contraction.



**Flexors:** A muscle which decreases the angle at a joint and acts to bend a limb.

**H zone:** The section composed of just myosin in the middle of a sarcomere which shortens during muscle contraction.

**I band:** The section of a sarcomere consisting of just actin filaments which shortens during contraction and is located between the Z line and the start of the A band.

**Laparoscopy (Keyhole surgery):** A type of minimally invasive surgery that uses a small incision and a camera to access the inner parts of the body such as the abdomen.

**Ligament:** A tough section of connective tissue that connects two bones together at a joint.

**Myosin:** A protein molecule composed of a head and a tail which plays an important role in muscle contraction along with actin.

**Sarcolemma:** The membrane which surrounds a muscle cell.

**Sarcomere:** A singular unit of muscle fibre between two different Z lines.

**Sarcoplasm:** The cytoplasm of a muscle cell.

**Sarcoplasmic reticulum:** A structure similar to an endoplasmic reticulum found inside muscle cells which is used to store calcium ions.

**Sliding filament theory:** A theory that explains muscle contraction through the sliding of actin and myosin filaments.

**Slow twitch muscle fibre:** A type of muscle fibre which is able to contract slowly for longer periods of time but with less force than fast twitch fibres.

**Tropomyosin:** A helical protein which blocks the myosin binding sites on the actin filament and works together with troponin to allow myosin to bind to actin during muscle stimulation.

**Troponin:** A protein complex which is attached to tropomyosin and binds  $\text{Ca}^{2+}$  ions which causes it to pull on tropomyosin to allow muscle contraction to take place.

**Type 2 diabetes:** A type of diabetes where the body fails to produce insulin or when the pancreas no longer reacts to insulin which can be caused by a poor diet and a lack of exercise.

**Z band:** The line between two adjacent sarcomere where the actin filaments are anchored.



## Topic 7 - Respiration

**ATP synthase:** An enzyme found in the inner mitochondrial membrane which is used to harness the energy of the proton gradient to phosphorylate ADP to form ATP.

**Chemiosmosis:** The passive diffusion of protons from a high concentration to a lower concentration across a partially permeable membrane used in oxidative phosphorylation.

**Glycolysis:** A series of reactions that occur in the cytoplasm and make up the first step in both aerobic and anaerobic respiration.

**Intracellular enzyme:** An enzyme that works within cells.

**Krebs cycle:** A series of steps used to oxidise Acetyl CoA and reduce the cofactors NAD and FAD for use in oxidative phosphorylation.

**Lactate:** The molecule produced from glucose through the process of anaerobic respiration which is oxidised mainly in the liver to produce glucose.

**Oxidative phosphorylation:** The last step in respiration where ATP is formed from ADP using the energy from a proton gradient established across the mitochondrial membrane by the electron transport chain.

**Phosphorylation:** The addition of a phosphate group to a molecule often using ATP hydrolysis.

**Pyruvate:** A 3 carbon molecule which is produced by glycolysis at an output of two molecules of pyruvate per one molecule of glucose.

**Respiration:** The process of splitting respiratory substrates to release carbon dioxide as a waste product and reuniting hydrogen with atmospheric oxygen with the release of a large amount of energy. †

**Substrate level phosphorylation:** The direct addition of a phosphate group onto ADP to form ATP

**The link reaction:** The reaction that converts pyruvate into acetyl CoA and is used to link glycolysis to the Krebs cycle by transporting pyruvate into the mitochondria.

Definitions denoted with a '†' taken from: [Edexcel Biology A Salters-Nuffield Specification, 9BN0, Issue 4 \(Pearson\)](#)

