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**GCSE Biology**

j0412704

**Module B7 – Further Biology:**

**What you should know**

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| **Name:**  **Science Group:**  **Teacher:** |

**R.A.G. each of the statements to help focus your revision:**

*R = Red: I don’t know this A = Amber: I partly know this G = Green: I know this*

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| B 7.1 Peak performance – movement and exercise | RAG |
| I understand that the internal skeleton of vertebrates is needed for support and movement |  |
| I understand that muscles can only move bones at a joint by contraction, and thus operate in antagonistic pairs |  |
| I can recall the structure and function of the components of a joint, to include:  a. smooth layer of cartilage and synovial fluid to reduce friction between bones  b. elastic ligaments to stabilise joints while allowing movement  c. tendons to transmit the forces between muscle and bones |  |
| I understand how the specific properties of ligaments, cartilage and tendons enable them to function effectively |  |
| I can explain why certain factors in a person’s medical or lifestyle history need to be disclosed before an exercise regime is started (for example: symptoms, current medication, alcohol and tobacco consumption, level of physical activity, family medical history and previous treatments) |  |
| I can interpret data obtained when monitoring a person during and after exercise, including change in heart rate, change in blood pressure and the recovery period |  |
| 7. use proportion of body fat and body mass index (BMI) as measurements of fitness |  |
| 8. use the equation:  BMI = body mass (kg)  [height (m)]2 |  |
| **I understand that any assessment of progress needs to take into account the accuracy of the monitoring technique and the repeatability of the data obtained** |  |
| I can recall common injuries that can be caused by excessive exercise, to include sprains, dislocations, and torn ligaments or tendons |  |
| I can recall symptoms and basic treatments for a sprain |  |
| I can describe the role of the physiotherapist in treatment of skeletal-muscular injury. |  |

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| B 7.2 Peak performance – circulation | RAG |
| I can explain what is meant by a double circulatory system |  |
| I understand that the blood carries glucose molecules and oxygen to the muscles, and waste products such as carbon dioxide away from muscles |  |
| I can relate the components of the blood to their functions, including:  a. red blood cells – transport oxygen  b. white blood cells –fighting infections  c. platelets – blood clotting at injury sites  d. plasma – transporting nutrients (e.g. glucose and amino acids), antibodies, hormones and waste (carbon dioxide and urea) |  |
| I understand how red blood cells are adapted to their function by:  a. being packed with haemoglobin (to bind oxygen)  b. having no nucleus (more space for haemoglobin)  **c. having a biconcave shape (increased surface area for oxygen exchange)** |  |
| I can describe and name the main structures and blood vessels of the heart including the left and right atria and ventricles, vena cava, aorta, pulmonary vein, pulmonary artery, coronary arteries and valves |  |
| I can describe the function of valves in the heart and veins |  |
| **I understand how tissue fluid is formed in capillary beds and that it assists the exchange of chemicals by diffusion between capillaries and tissues, to include oxygen, carbon dioxide, glucose and urea.** |  |

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| **B7.3 Peak performance – energy balance** | **RAG** |
| I understand that to maintain a constant body temperature, heat gained (including heat released during respiration) is balanced by heat lost |  |
| I can recall that temperature receptors in the skin detect external temperature |  |
| I can recall that temperature receptors in the brain (**hypothalamus**) detect the temperature of the blood |  |
| I understand that the brain (**hypothalamus**) acts as a processing centre, receiving information from the temperature receptors, and sending instructions to trigger the effectors automatically |  |
| I can recall that effectors include sweat glands and muscles |  |
| I understand that at high body temperatures:  a. more sweat is produced by sweat glands which cools the body when it evaporates  **b. blood vessels supplying the capillaries of the skin dilate (vasodilation) allowing more blood to flow through skin capillaries which increases heat loss** |  |
| I can explain how exercise produces increased sweating, and can produce dehydration, which may lead to reduced sweating and further increase of core body temperature |  |
| I understand that at low body temperatures:  a. the increased rate of respiration stimulated when muscles contract rapidly (shivering) results in some of the energy transferred in respiration warming the surrounding tissues  **b. blood vessels supplying the capillaries of the skin constrict (vasoconstriction) restricting blood flow through skin capillaries which reduces heat loss** |  |
| **I understand that some effectors work antagonistically, which allows a more sensitive and controlled response** |  |
| I understand that high levels of sugar, common in some processed foods, are quickly absorbed into the blood stream, causing a rapid rise in the blood sugar level |  |

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| **B7.3 Peak performance – energy balance *Continued*** | **RAG** |
| I can recall that there are two types of diabetes (type 1 and type 2), and that it is particularly late-onset diabetes (type 2) which is more likely to arise because of poor diet or obesity |  |
| I understand that type 1 diabetes arises when the pancreas stops producing enough of the hormone, insulin, but that type 2 diabetes develops when the body no longer responds to its own insulin or does not make enough insulin |  |
| I can recall that type 1 diabetes is controlled by insulin injections and that type 2 diabetes can be controlled by diet and exercise |  |
| I can explain how a diet high in fibre and complex carbohydrates can help to maintain a constant blood sugar level |  |
| I can interpret data on risks associated with an unhealthy lifestyle (limited to poor diet and lack of exercise), including obesity, heart disease, diabetes and some cancers. |  |

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| **B7.4 What can we learn from natural ecosystems?** | **RAG** |
| I can recall that a perfect closed loop system is a system that has no waste because the output from one part of the system becomes the input to another part |  |
| I understand that an ecosystem is a type of closed loop system since most waste materials are not lost but are used as food or reactants |  |
| I can name examples of waste products in natural ecosystems, to include oxygen (from photosynthesis), carbon dioxide (from respiration), and dead organic matter such as fallen petals, leaves and fruits, and faeces |  |
| I understand how these waste products may become food or reactants for animals, plants and microorganisms in the ecosystem, including the role of the digestive enzymes of microorganisms |  |
| I can interpret closed loop system diagrams and data on the storage and movement of chemicals through an ecosystem, including water, carbon, nitrogen and oxygen |  |
| I understand that no ecosystem is a perfect closed loop system since some output is always lost, e.g. migration of organisms and loss of nutrients transferred by air or water |  |
| **B7.4 What can we learn from natural ecosystems? *Continued*** | **RAG** |
| I understand that in stable ecosystems, including rainforests, the output (losses) is balanced by gains |  |
| I understand why the production of large quantities of reproductive structures, including eggs, sperm, pollen, flowers and fruit, is a necessary strategy for successful reproduction |  |
| I understand that, in stable ecosystems, the production of large quantities of these reproductive structures is not wasteful, since the surplus is recycled in the ecosystem |  |
| I can recall that vegetation in stable ecosystems, such as rain forests, prevents soil erosion and extremes of temperature, and promotes cloud formation |  |
| I understand that vegetation reduces soil erosion since foliage protects the soil from direct rainfall and roots help to bind the soil together |  |
| I understand that humans depend on natural ecosystems to provide ‘ecosystem services’, for example providing clean air, water, soil, mineral nutrients, pollination, fish and game |  |
| I understand that human systems are not closed loop systems because some waste leaves the system, including non-recycled waste from households, agriculture and industry, and emissions from burning fossil fuels |  |
| I understand that some non-recycled waste can build up to harmful levels, **including bioaccumulation in food chains** |  |
| I understand that human activity can unbalance natural ecosystems by altering the inputs and outputs, and that this leads to change |  |
| **I can describe and explain the process of eutrophication** |  |
| I can describe the environmental impact of removing biomass from natural closed loop systems for human use, to include unsustainable timber harvesting and fishing |  |
| I can explain the impact of replacing vegetation in natural ecosystems with agricultural crops and livestock, to include the loss of biodiversity, silting of rivers and desertification |  |
| I understand that the use of natural resources by humans can only be sustainable if used at a rate at which they can be replaced |  |

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| **B7.4 What can we learn from natural ecosystems? *Continued*** | **RAG** |
| I understand why the use of crude oil does not fulfil the requirements of a closed loop system, including:  a. crude oil takes millions of years to form from the decay of dead organisms  b. energy released from burning crude oil originated from the Sun when these organisms were alive (‘fossil sunlight energy’) |  |
| I can recall and understand solutions to allow sustainable harvesting of natural resources such as timber and fish, including the use of quotas and restocking/replanting |  |
| I can describe the role of sunlight as a sustainable source of energy for natural ecosystems and sustainable agriculture |  |
| I understand the tensions between conserving natural ecosystems and the needs of local human communities. |  |

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| **B7.5 New Technologies** | **RAG** |
| I can recall the features of bacteria that make them ideal for industrial and genetic processes to include:  a. rapid reproduction  b. presence of plasmids  c. simple biochemistry  d. ability to make complex molecules  e. lack of ethical concerns in their culture |  |
| I understand that bacteria and fungi can be grown on a large scale (fermentation) to include  production of:  a. antibiotics and other medicines  b. single-cell protein  c. enzymes for food processing, for example chymosin as a vegetarian substitute for rennet  d. enzymes for commercial products, such as washing powders and to make biofuels |  |
| I can recall that genetic modification is where a gene from one organism is transferred to another and continues to work |  |
| **B7.5 New Technologies *Continued*** | **RAG** |
| I can recall the main steps in genetic modification as:  a. isolating and replicating the required gene  b. putting the gene into a suitable vector (virus or plasmid)  c. using the vector to insert the gene into a new cell  d. selecting the modified individuals |  |
| I can recall examples of the application of genetic modification, to include:  a. bacterial synthesis of medicines, for example insulin  b. herbicide resistance in crop plants |  |
| **I understand and explain the use of DNA technology in genetic testing, to include:**  **a. isolation of a DNA sample from white blood cells**  **b. production of a gene probe labelled with a fluorescent chemical**  **c. addition of the labelled gene probe (marker) to the DNA sample**  **d. use of UV to detect the marker and therefore indicate the position of the gene or**  **the presence of a specific allele in the DNA sample** |  |
| I can recall that nanotechnology involves structures that are about the same size as some molecules |  |
| I can describe the application of nanotechnology in the food industry, including food packaging which can increase shelf life and detect contaminants |  |
| I can describe applications of stem cell technology in tissue and organ culture, including the treatment of leukaemia and the potential to treat spinal cord injuries |  |
| I can describe the role of biomedical engineering in pacemakers and the replacement of faulty heart valves. |  |

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| **Grades A\* - C (Higher)** | All statements shown in **bold** as well as all statements shown in normal type. |
| **Grades C – G (Foundation)** | All statements shown in normal type. |