

**GCSE Additional Science**



**Module B4 – The processes of life:**

**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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| **B4.1 How do chemical reactions take place in living things?** | **R.A.G.** |
| I understand that the basic processes of life carried out by all living things depend on chemical reactions within cells that require energy released by respiration |  |
| I understand the role of photosynthesis in making food molecules and energy available to living organisms through food chains |  |
| I can describe photosynthesis as a series of chemical reactions that use energy from sunlight to build large food molecules in plant cells and some microorganisms (e.g. phytoplankton) |  |
| I can describe respiration as a series of chemical reactions that release energy by breaking down large food molecules in all living cells |  |
| I can recall that enzymes are proteins that speed up chemical reactions |  |
| I can recall that cells make enzymes according to the instructions carried in genes |  |
| I understand that molecules have to be the correct shape to fit into the active site of I the enzyme (the lock and key model) |  |
| I understand that enzymes need a specific constant temperature to work at their optimum, and that they permanently stop working **(denature)** if the temperature is too high |  |
| **I can explain that enzyme activity at different temperatures is a balance between:****a. increased rates of reaction as temperature increases****b. changes to the active site at higher temperatures, including denaturing** |  |
| I can recall that an enzyme works at its optimum at a specific pH |  |
| **I can explain the effect of pH on enzyme activity in terms of changes to the shape of the active site.** |  |

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| **B4.2 How do plants make food?** | **R.A.G.** |
| I can recall the names of the reactants and products of photosynthesis, and use the word equation: *light energy* carbon dioxide + water → glucose + oxygen |  |
| I can **recall the formulae of the reactants and products of photosynthesis, and use the symbol equation:** ***light energy*** **6CO2 + 6H2O → C6H12O6 + 6O2** |  |
| I can recall the main stages of photosynthesis:a. light energy absorbed by the green chemical chlorophyllb. energy used to bring about the reaction between carbon dioxide and water toproduce glucose (a sugar)c. oxygen produced as a waste product |  |
| I canrecall that glucose may be:a. converted into chemicals needed for growth of plant cells, for example cellulose,protein and chlorophyllb. converted into starch for storagec. used in respiration to release energy |  |
| I canrecall the structure of a typical plant cell, limited to chloroplasts, cell membrane, nucleus,cytoplasm, mitochondria, vacuole and cell wall |  |
| I canrecall the structure of a typical plant cell, limited to chloroplasts, cell membrane, nucleus,cytoplasm, mitochondria, vacuole and cell wall |  |
| I can recall that minerals taken up by plant roots are used to make some chemicals needed by cells, including nitrogen from nitrates to make proteins |  |
| I understand that diffusion is the passive overall movement of molecules from a region of their higher concentration to a region of their lower concentration |  |
| I can recall that the movement of oxygen and carbon dioxide in and out of leaves during photosynthesis occurs by diffusion |  |

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| **B4.2 How do plants make food? *Continued*** | **R.A.G.** |
| I understand the functions of the structures in a typical plant cell that have a role in photosynthesis, including:a. chloroplasts contain chlorophyll and the enzymes for the reactions in photosynthesisb. cell membrane allows gases and water to pass in and out of the cell freely while presenting a barrier to other chemicalsc. nucleus contains DNA which carries the genetic code for making enzymes and otherproteins used in the chemical reactions of photosynthesisd. cytoplasm where the enzymes and other proteins are made |  |
| Iunderstand that osmosis (a specific case of diffusion) is the overall movement of water froma dilute to a more concentrated solution through a partially permeable membrane |  |
| I can recall that the movement of water into plant roots occurs by osmosis |  |
| **I understand that active transport is the overall movement of chemicals across a cell membrane requiring energy from respiration** |  |
| **I recall that active transport is used in the absorption of nitrates by plant roots** |  |
| I understand that the rate of photosynthesis may be limited by:a. temperatureb. carbon dioxidec. light intensity |  |
| I caninterpret data on factors limiting the rate of photosynthesis |  |
| I can describe and explain techniques used in fieldwork to investigate the effect of light on plants, including:a. using a light meterb. using a quadratc. using an identification key |  |
| I understand how to take a transect. |  |

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| **B4.3 How do living organisms obtain energy?** | **R.A.G.** |
| I understand that all living organisms require energy released by respiration for somechemical reactions in cells, including chemical reactions involved in:a. movementb. synthesis of large molecules**c. active transport** |  |
| I understand that synthesis of large molecules includes:a. synthesis of polymers required by plant cells such as starch and cellulose fromglucose in plant cellsb. synthesis of amino acids from glucose and nitrates, and then proteins from aminoacids in plant, animal and microbial cells |  |
| I can recall that aerobic respiration takes place in animal and plant cells and somemicroorganisms, and requires oxygen |  |
| I can recall the names of the reactants and products of aerobic respiration and use the word equation: glucose + oxygen → carbon dioxide + water (+ energy released) |  |
| **I can recall the formulae of the reactants and products of aerobic respiration and use the symbol equation:** **C6H12O6 + 6O2 → 6CO2 + 6H2O** |  |
| I can recall that anaerobic respiration takes place in animal, plant and some microbial cells in conditions of low oxygen or absence of oxygen, to include:a. plant roots in waterlogged soilb. bacteria in puncture woundsc. human cells during vigorous exercise |  |
| I can recall the names of the reactants and products of anaerobic respiration in animal cells and some bacteria, and use the word equation: glucose → lactic acid (+ energy released) |  |
| **B4.3 How do living organisms obtain energy?*****Continued*** | **R.A.G.** |
| I canrecall the names of the reactants and products of anaerobic respiration in plant cells and some microorganisms including yeast, and use the word equation:glucose → ethanol + carbon dioxide (+ energy released) |  |
| I understand that aerobic respiration releases more energy per glucose molecule thananaerobic respiration |  |
| I can recall the structure of typical animal and microbial cells (bacteria and yeast) limited to:a. nucleusb. cytoplasmc. cell membraned. mitochondria (for animal and yeast cells)e. cell wall (for yeast and bacterial cells)f. circular DNA molecule (for bacterial cells) |  |
| understand the functions of the structures in animal, plant, bacteria and yeast cells that havea role in respiration, including:1. mitochondria contain enzymes for the reactions in aerobic respiration (in animals, plants and yeast)

b. cell membrane allows gases and water to pass in and out of the cell freely whilepresenting a barrier to other chemicalsc. nucleus or circular DNA in bacteria contains DNA which carries the genetic code formaking enzymes used in the chemical reactions of respirationd. cytoplasm where enzymes are made and which contains the enzymes used in1. anaerobic respiration
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| I describe examples of the applications of the anaerobic respiration of microorganisms, including the production of biogas and fermentation in bread making and alcohol production. |  |

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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. |