**Little Heath Sixth Form**

**Biology**

Personal Learning Checklist

**Student Name: ……………………….…………………………………..………**

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| **Unit Name:**  **Populations and environment** | **Unit Code:**  **BIOL4** |
| *Minimum Target Grade:* | *Aspirational Target Grade:* |

*KEY:* ***Red =*** *with difficulty* ***Amber*** *= not sure* ***Green*** *= yes*

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| **GCSE Re-Cap** | |  | **Red** | **Amber** | **Green** |
| **B3 Life on Earth** | * Interdependence (food webs/chains) * Energy transfer through an ecosystem * Decomposers/detritivores * Carbon cycle * Nitrogen cycle (incl: nitrogen fixation & denitrification) | |  |  |  |
| ***B4 The processes of life*** | * How plants make food by photosynthesis (word & symbol equations, processes, limiting factors) * Leaf and root hair cells – structures & functions of organelles * How organisms obtain energy by respiration (word & symbol equations, processes) * Anaerobic respiration * Structure & functions of animal cells & their organelles * Techniques used in fieldwork to investigate the effect of light on plants | |  |  |  |
| ***B7 Further Biology***  ***(triple Bio)*** | * Closed loop systems * Waste products in a natural ecosystem | |  |  |  |

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| **Knowledge/specification content (skills are highlighted in bold)** | | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| 3.4.1 Populations and ecosystems | A population is all the organisms of one species in a habitat. Populations of different species form a community. |  |  |  |  |
| Within a habitat a species occupies a niche governed by adaptation to both biotic and abiotic conditions. |  |  |  |  |
| 3.4.1 Investigating populations | A critical appreciation of some of the ways in which the numbers and distribution of organisms may be investigated. |  |  |  |  |
| Random sampling with quadrats and counting along transects to obtain quantitative data. |  |  |  |  |
| The use of percentage cover and frequency as measures of abundance. |  |  |  |  |
| The use of mark–release–recapture for more mobile species. |  |  |  |  |
| **In the context of investigating populations, candidates should**  **• carry out experimental and investigative activities, including appropriate risk management**  **• consider ethical issues arising when carrying out fieldwork, particularly those relating to the organisms involved and their environment**  **• analyse and interpret data relating to the distribution of organisms, recognising correlations and causal relationships**  **• appreciate the tentative nature of conclusions that may be drawn from such data.** |  |  |  |  |
| 3.4.1 Variation in population size | Population size may vary as a result of  • the effect of abiotic factors  • interactions between organisms: interspecific and intraspecific competition and predation. |  |  |  |  |
| 3.4.1 Human populations | Population size and structure, population growth rate, age-population pyramids, survival rates and life expectancy. |  |  |  |  |
| **Candidates should be able to:**  **• interpret growth curves, survival curves and age-population pyramids**  **• calculate population growth rates from data on birth rate and death rate.**  **• relate changes in the size and structure of human populations to different stages in demographic transition.** |  |  |  |  |
| 3.4.2 ATP | The synthesis of ATP from ADP and phosphate and its role as the immediate source of energy for biological processes. |  |  |  |  |
| 3.4.3 Photosynthesis | The light-independent and light-dependent reactions in a typical C3 plant. |  |  |  |  |
| 3.4.3 Light-dependent  Reaction | The light-dependent reaction in such detail as to show that:  • light energy excites electrons in chlorophyll  • energy from these excited electrons generates ATP and reduced NADP  • the production of ATP involves electron transfer associated with the electron transfer chain in chloroplast membranes  • photolysis of water produces protons, electrons and oxygen. |  |  |  |  |
| 3.4.3 Light-independent  Reaction | The light-independent reaction in such detail as to show that:  • carbon dioxide is accepted by ribulose bisphosphate (RuBP) to form two molecules of glycerate 3-phosphate (GP)  • ATP and reduced NADP are required for the reduction of GP to triose phosphate  • RuBP is regenerated in the Calvin cycle  • Triose phosphate is converted to useful organic substances. |  |  |  |  |
| 3.4.3 Limiting factors | The principle of limiting factors as applied to the effects of temperature, carbon dioxide concentration and light intensity on the rate of photosynthesis. |  |  |  |  |
| **Candidates should be able to explain how growers apply a knowledge of limiting factors in enhancing temperature, carbon dioxide concentration and light intensity in commercial glasshouses.**  **You should also be able to evaluate such applications using appropriate data.** |  |  |  |  |
| 3.4.4 Aerobic respiration | Aerobic respiration in such detail as to show that  • glycolysis takes place in the cytoplasm and involves the oxidation of glucose to pyruvate with a net gain of ATP and reduced NAD  • pyruvate combines with coenzyme A in the link reaction to produce acetylcoenzyme A  • in a series of oxidation-reduction reactions the Krebs cycle generates reduced coenzymes and ATP by substrate-level phosphorylation, and carbon dioxide is lost  • acetylcoenzyme A is effectively a two carbon molecule that combines with a four carbon molecule to produce a six carbon molecule which enters the Krebs cycle  • synthesis of ATP by oxidative phosphorylation is associated with the transfer of electrons down the electron transport chain and passage of protons across mitochondrial membranes. |  |  |  |  |
| 3.4.4 Anaerobic  respiration | Glycolysis followed by the production of ethanol or lactate and the regeneration of NAD in anaerobic respiration. |  |  |  |  |
| 3.4.5 Energy transfer | Photosynthesis is the main route by which energy enters an ecosystem. |  |  |  |  |
| Energy is transferred through the trophic levels in food chains and food webs and is dissipated. |  |  |  |  |
| Quantitative consideration of the efficiency of energy transfer between trophic levels. |  |  |  |  |
| Pyramids of numbers, biomass and energy and their relationship to their corresponding food chains and webs. |  |  |  |  |
| 3.4.5 Energy and food  production | Comparison of natural ecosystems and those based on modern intensive farming in terms of energy input and productivity. |  |  |  |  |
| Net productivity as defined by the expression  Net productivity = Gross productivity – Respiratory loss |  |  |  |  |
| The ways in which productivity is affected by farming practices that increase the efficiency of energy conversion. These include  • the use of natural and artificial fertilisers  • the use of chemical pesticides, biological agents and integrated systems in controlling pests on agricultural crops  • intensive rearing of domestic livestock. |  |  |  |  |
| **Candidates should be able to**  **• apply their understanding of biological principles to present scientific arguments that explain how these and other farming practices affect productivity**  **• evaluate economic and environmental issues involved with farming practices that increase productivity**  **• consider ethical issues arising from enhancement of productivity.** |  |  |  |  |
| 3.4.6 Nutrient cycles | The role of microorganisms in the carbon and nitrogen cycles in sufficient detail to illustrate the processes of saprobiotic nutrition, ammonification, nitrification, nitrogen fixation and denitrification.  (The names of individual species are not required.) |  |  |  |  |
| 3.4.6 Carbon | The importance of respiration, photosynthesis and human activity in giving rise to short-term fluctuation and long-term change in global carbon dioxide concentration. |  |  |  |  |
| The roles of carbon dioxide and methane in enhancing the greenhouse effect and bringing about global warming. |  |  |  |  |
| **Candidates should be able to analyse, interpret and evaluate data relating to evidence of global warming and its effects on:**  **• the yield of crop plants**  **• the life-cycles and numbers of insect pests**  **• the distribution and numbers of wild animals and plants.** |  |  |  |  |
| 3.4.6 Nitrogen | The environmental issues arising from the use of fertilisers.  Leaching and eutrophication. |  |  |  |  |
| **Candidates should be able to analyse, interpret and evaluate data relating to eutrophication.** |  |  |  |  |
| 3.4.7 Succession | Succession from pioneer species to climax community. |  |  |  |  |
| At each stage in succession, certain species may be recognised which change the environment so that it becomes more suitable for other species. |  |  |  |  |
|  | The changes in the abiotic environment result in a less hostile environment and changing diversity. |  |  |  |  |
| Conservation of habitats frequently involves management of succession. |  |  |  |  |
| **Candidates should be able to**  **• use their knowledge and understanding to present scientific arguments and ideas relating to the conservation of species and habitats**  **• evaluate evidence and data concerning issues relating to the conservation of species and habitats and consider conflicting evidence**  **• explain how conservation relies on science to inform decision-making.** |  |  |  |  |
| 3.4.8 Inheritance | The genotype is the genetic constitution of an organism. |  |  |  |  |
| The phenotype is the expression of this genetic constitution and its interaction with the environment. |  |  |  |  |
| Alleles are one or more alternative versions of the same gene. The alleles at a specific locus may be either homozygous or heterozygous. |  |  |  |  |
| Alleles may be dominant, recessive or codominant. |  |  |  |  |
| There may be multiple alleles of a single gene. |  |  |  |  |
| **Candidates should be able to use fully labelled genetic diagrams to predict the results of**  **• monohybrid crosses involving dominant, recessive and codominant alleles**  **• crosses involving multiple alleles and sex-linked characteristics.** |  |  |  |  |
| 3.4.8 The Hardy-  Weinberg principle | Species exist as one or more populations. |  |  |  |  |
| The concepts of gene pool and allele frequency. |  |  |  |  |
| The Hardy-Weinberg principle. The conditions under which the principle applies. |  |  |  |  |
| **Candidates should be able to calculate allele, genotype and phenotype frequencies from appropriate data and from the Hardy-Weinberg equation, p2 + 2pq + q2 = 1**  **where p is the frequency of the dominant allele and q is the frequency of the recessive allele.** |  |  |  |  |
| **Candidates should understand that the Hardy-Weinberg principle provides a mathematical model which predicts that allele frequencies will not change from generation to generation.** |  |  |  |  |
| 3.4.8 Selection | Differential reproductive success and its effect on the allele frequency within a gene pool. |  |  |  |  |
| Directional and stabilising selection. |  |  |  |  |
|  | **Candidates should be able to**  **• use both specific examples and unfamiliar information to explain how selection produces changes within a species**  **• interpret data relating to the effect of selection in producing change within populations.** |  |  |  |  |
| 3.4.8 Speciation | Geographic separation of populations of a species can result in the accumulation of difference in the gene pools. |  |  |  |  |
| The importance of geographic isolation in the formation of new species |  |  |  |  |

**Grade tracking:**

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*Note: You should discuss this checklist regularly with your subject teacher/mentor*