**Little Heath Sixth Form**

**Biology**

Personal Learning Checklist

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

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| **Unit Name:**  **The variety of living organisms** | **Unit Code:**  **BIOL2** |
| *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** |
| **B1 You and Your Genes** | * Cell, nucleus, chromosomes, genes, DNA * Genes code for proteins * Homozygous/heterozygous, dominant/recessive alleles | |  |  |  |
| ***B3 Life on Earth*** | * Classification – using physical features and DNA * Kingdom 🡪 species * Importance of biodiversity, extinction & sustainability | |  |  |  |
| **B5 Growth and Development** | * Cell division – mitosis & meiosis * DNA structure, bases, triplet code, * Order of bases in a gene is the genetic code for the production of a protein * Cell differentiation (stem cells 🡪 specialised cells) | |  |  |  |

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| **Knowledge/specification content (skills are highlighted in bold)** | | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| 3.2.1  Investigating variation | Variation exists between members of a species. |  |  |  |  |
| The need for random sampling, and the importance of chance in contributing to differences between samples. |  |  |  |  |
| The concept of normal distribution about a mean. Understanding mean and standard deviation as measures of variation within a sample. |  |  |  |  |
| Candidates will not be required to calculate standard deviation in questions on written papers.  **Candidates should be able to analyse and interpret data relating to interspecific and intraspecific variation.** |  |  |  |  |
| 3.2.1  Causes of variation  3.2.2  Structure of DNA | Similarities and differences between individuals within a species may be the result of genetic factors, differences in environmental factors, or a combination of both. |  |  |  |  |
| **Candidates should appreciate the tentative nature of any conclusions that can be**  **drawn relating to the causes of variation.** |  |  |  |  |
| The double-helix structure of DNA, enabling it to act as a stable information-carrying molecule, in terms of  • the components of DNA nucleotides: deoxyribose, phosphate and the bases adenine, cytosine, guanine and thymine  • two sugar-phosphate backbones held together by hydrogen bonds between base pairs  • specific base pairing. |  |  |  |  |
| 3.2.2  Genes and polypeptides | A gene occupies a fixed position, called a locus, on a particular strand of DNA. |  |  |  |  |
| Genes are sections of DNA that contain coded information as a specific sequence of bases. |  |  |  |  |
| Genes code for polypeptides that determine the nature and development of organisms. |  |  |  |  |
| The base sequence of a gene can change as a result of a mutation, producing one or more alleles of the same gene. |  |  |  |  |
| A sequence of three bases, called a triplet, codes for a specific amino acid. |  |  |  |  |
| The base sequence of a gene determines the amino acid sequence in a polypeptide. |  |  |  |  |
| In eukaryotes, much of the nuclear DNA does not code for polypeptides. There are, for example, introns within genes and multiple repeats between genes. Differences in base sequences of alleles of a single gene may result in non-functional proteins, including non-functional enzymes. |  |  |  |  |
| 3.2.2  DNA and chromosomes | In eukaryotes, DNA is linear and associated with proteins. In prokaryotes, DNA molecules are smaller, circular and are not associated with proteins. |  |  |  |  |
| 3.2.2  Meiosis | The importance of meiosis in producing cells which are genetically different. Within this unit, meiosis should be studied only in sufficient detail to show  • the formation of haploid cells  • independent segregation of homologous chromosomes. Gametes are genetically different as a result of different combinations of maternal and paternal chromosomes  • genetic recombination by crossing over. |  |  |  |  |
| 3.2.3  Genetic diversity  3.2.4  Haemoglobin | Similarities and differences between organisms may be defined in terms of variation in DNA. Differences in DNA lead to genetic diversity. |  |  |  |  |
| The influence of the following on genetic diversity  • selection for high-yielding breeds of domesticated animals and strains of plants  • the founder effect  • genetic bottlenecks. |  |  |  |  |
| **Candidates should be able to discuss ethical issues involved in the selection of domesticated animals.** |  |  |  |  |
| The haemoglobins are a group of chemically similar molecules found in many different organisms. |  |  |  |  |
| Haemoglobin is a protein with a quaternary structure. |  |  |  |  |
| The role of haemoglobin in the transport of oxygen. |  |  |  |  |
| The loading, transport and unloading of oxygen in relation to the oxygen dissociation curve. |  |  |  |  |
| The effects of carbon dioxide concentration. |  |  |  |  |
| **Candidates should be aware that different organisms possess different types of haemoglobin with different oxygen transporting properties. They should be able to relate these to the environment and way of life of the organism concerned.** |  |  |  |  |
| 3.2.4  Carbohydrates | The structure of b-glucose    and the linking of b-glucose by glycosidic bonds formed by condensation to form cellulose. |  |  |  |  |
| The basic structure and functions of starch, glycogen and cellulose and the relationship of structure to function of these substances in animals and plants. |  |  |  |  |
| 3.2.4  Cells | There are fundamental differences between plant cells and animal cells. |  |  |  |  |
| The structure of a palisade cell from a leaf as seen with an optical microscope. |  |  |  |  |
| The appearance, ultrastructure and function of  • cell wall  • chloroplasts. |  |  |  |  |
| **Candidates should be able to apply their knowledge of these and other eukaryotic features in explaining adaptations of other plant cells.** |  |  |  |  |
| 3.2.5  Replication of DNA | The semi-conservative replication of DNA in terms of  • breaking of hydrogen bonds between polynucleotide strands  • attraction of new DNA nucleotides to exposed bases and base pairing  • role of DNA helicase and of DNA polymerase. |  |  |  |  |
| **Candidates should be able to analyse, interpret and evaluate data concerning early experimental work relating to the role and importance of DNA.** |  |  |  |  |
| 3.2.5  Mitosis | During mitosis, the parent cell divides to produce two daughter cells, each containing an exact copy of the DNA of the parent cell. Mitosis increases the cell number in this way in growth and tissue repair. |  |  |  |  |
| **Candidates should be able to name and explain the events occurring during each stage of mitosis. They should be able to recognise the stages from drawings and photographs.** |  |  |  |  |
| 3.2.5  Cell cycle | Mitosis and the cell cycle. |  |  |  |  |
| DNA is replicated and this takes place during interphase. |  |  |  |  |
| **Candidates should be able to relate their understanding of the cell cycle to cancer**  **and its treatment.** |  |  |  |  |
| 3.2.6  Cell differentiation | The cells of multicellular organisms may differentiate and become adapted for specific functions. |  |  |  |  |
| Tissues as aggregations of similar cells, and organs as aggregations of tissues performing specific physiological functions. Organs are organised into systems. |  |  |  |  |
| 3.2.7  Size and surface area | The relationship between the size of an organism or structure and surface area to volume ratio. Changes to body shape and the development of systems in larger organisms as adaptations that facilitate exchange as the ratio reduces. |  |  |  |  |
| **Candidates should be able to explain the significance of the relationship between size and surface area to volume ratio for the exchange of substances and of heat.** |  |  |  |  |
| 3.2.7  Gas exchange | Gas exchange  • across the body surface of a single-celled organism  • in the tracheal system of an insect (tracheae and spiracles)  • across the gills of a fish (gill lamellae and filaments including the countercurrent principle)  • by leaves of dicotyledonous plants (mesophyll and stomata). |  |  |  |  |
| **Candidates should be able to use their knowledge and understanding of the principles of diffusion to explain the adaptations of gas exchange surfaces.** |  |  |  |  |
| Structural and functional compromises between the opposing needs for efficient gas exchange and the limitation of water loss shown by terrestrial insects and xerophytic plants. |  |  |  |  |
| 3.2.7  Mass transport | Over large distances, efficient supply of materials is provided by mass transport. |  |  |  |  |
| 3.2.7  The blood system | The general pattern of blood circulation in a mammal. Names are required only of the coronary arteries and of blood vessels entering and leaving the heart, liver and kidneys. |  |  |  |  |
| The structure of arteries, arterioles and veins in relation to their function. |  |  |  |  |
| The structure of capillaries and their importance in metabolic exchange. |  |  |  |  |
| The formation of tissue fluid and its return to the circulatory system. |  |  |  |  |
| 3.2.7  The passage of water through a plant | The structure of a dicotyledonous root in relation to the pathway of water from root hairs through the cortex and endodermis to the xylem. Apoplastic and symplastic pathways. |  |  |  |  |
| Transpiration and the effects of light, temperature, humidity and air movement. |  |  |  |  |
| The roles of root pressure and cohesion-tension in moving water through the xylem. |  |  |  |  |
| 3.2.8  Principles of taxonomy | The principles and importance of taxonomy.  Classification systems consist of a hierarchy in which groups are contained within larger  composite groups and there is no overlap. |  |  |  |  |
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| The phylogenetic groups are based on patterns of evolutionary history. |  |  |  |  |
| A species may be defined in terms of observable similarities and the ability to  produce fertile offspring. |  |  |  |  |
| One hierarchy comprises Kingdom, Phylum, Class, Order, Family, Genus, Species. |  |  |  |  |
| **Candidates should be able to appreciate the difficulties of defining species and the tentative nature of classifying organisms as distinct species.** |  |  |  |  |
| 3.2.9  Genetic  comparisons | Genetic comparisons can be made between different species by direct examination of their DNA or of the proteins encoded by this DNA. |  |  |  |  |
| 3.2.9  DNA | Comparison of DNA base sequences is used to elucidate relationships between organisms. |  |  |  |  |
| These comparisons have led to new classification systems in plants. |  |  |  |  |
| Similarities in DNA may be determined by DNA hybridisation. |  |  |  |  |
| 3.2.9  Proteins | Comparisons of amino acid sequences in specific proteins can be used to elucidate relationships between organisms. |  |  |  |  |
| Immunological comparisons may be used to compare variations in specific proteins. |  |  |  |  |
| **Candidates should be able to interpret data relating to similarities and differences in base sequences in DNA and in amino acid sequences in proteins to suggest relationships between different organisms.** |  |  |  |  |
| 3.2.9  Behaviour | Courtship behaviour as a necessary precursor to successful mating. The role of courtship in species recognition. |  |  |  |  |
| 3.2.10  Antibiotics | Antibiotics may be used to treat bacterial disease. One way in which antibiotics function is by preventing the formation of bacterial cell walls, resulting in osmotic lysis. |  |  |  |  |
| 3.2.10  Genetic variation in bacteria | DNA is the genetic material in bacteria as well as in most other organisms. |  |  |  |  |
| Mutations are changes in DNA and result in different characteristics. |  |  |  |  |
| Mutations in bacteria may result in resistance to antibiotics. |  |  |  |  |
| Resistance to antibiotics may be passed to subsequent generations by vertical gene transmission. |  |  |  |  |
| Resistance may also be passed from one species to another when DNA is transferred during conjugation. This is horizontal gene transmission. Antibiotic resistance in terms of the difficulty of treating tuberculosis and MRSA. |  |  |  |  |
| **Candidates should be able to**  **• apply the concepts of adaptation and selection to other examples**  **• evaluate methodology, evidence and data relating to antibiotic resistance**  **• discuss ethical issues associated with the use of antibiotics**  **• discuss the ways in which society uses scientific knowledge relating to antibiotic resistance to inform decision-making.** |  |  |  |  |
| 3.2.11  Species diversity | Diversity may relate to the number of species present in a community.  The influence of deforestation and the impact of agriculture on species diversity |  |  |  |  |
| 3.2.11  Index of diversity | An index of diversity describes the relationship between the number of species and the number of individuals in a community. |  |  |  |  |
| Calculation of an index of diversity from the formula:    where N = total number of organisms of all species  and n = total number of organisms of each species |  |  |  |  |
| **Candidates should be able to**  **• calculate the index of diversity from suitable data**  **• interpret data relating to the effects of human activity on species diversity and be able to evaluate associated benefits and risks**  **• discuss the ways in which society uses science to inform the making of decisions relating to biodiversity.** |  |  |  |  |

**Grade tracking:**

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