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GCSE (9-1)

***GATEWAY SCIENCE BIOLOGY A***

**J247**

For first teach in 2016­

**Student revision checklist**

Version 1

**Student revision checklist**

**Revision checklists**

The tables below can be used as a revision checklist.

For more information please see the [OCR GCSE Biology A specification.](https://www.ocr.org.uk/Images/234594-specification-accredited-gcse-gateway-science-suite-biology-a-j247.pdf)

The table headings are explained below:

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| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| Here is a list of the learning outcomes for this qualification and the content you need to cover and work on.  **Please note the learning outcomes in bold are for Higher tier only.** | You can use the tick boxes to show when you have revised an item and how confident you feel about it.  R = **RED** means you are really unsure and lack confidence; you might want to focus your revision here and possibly talk to your teacher for help.  A = **AMBER** means you are reasonably confident but need some extra practice.  G = **GREEN** means you are very confident.  As your revision progresses, you can concentrate on the **RED** and **AMBER** items in order to turn them into **GREEN** items.  You might find it helpful to highlight each topic in red, orange or green to help you prioritise. | | | You can use the comments column to:   * add more information about the details for each point * add formulae or notes * include a reference to a useful resource * highlight areas of difficulty or things that you need to talk to your teacher about or look up in a textbook. |

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| **B1 Cell level systems** | | | | |
| **B1.1 Cell structures** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B1.1a describe how light microscopes and  staining can be used to view cells  *To include* – lenses, stage, lamp, use of slides and cover slips, and the use of stains to view colourless specimens or to highlight different structures/tissues and calculation of  magnification |  |  |  |  |
| B1.1b explain how the main sub-cellular structures of eukaryotic cells (plants and animals and prokaryotic cells are related to their functions  *To include –* nucleus, genetic material, chromosomes, plasmids, mitochondria (contain enzymes for cellular respiration), chloroplasts (contain chlorophyll), cell membranes (contain receptor molecules, provides a selective barrier to molecules) and ribosomes (site of protein synthesis) |  |  |  |  |

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| **B1 Cell level systems** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B1.1c explain how electron microscopy has increased our understanding of sub-cellular structures  *To include –* increased resolution in a transmission electron microscope |  |  |  |  |
| **B1.2 What happens in cells (and what do cells need)?** | | | | |
| B1.2a describe DNA as a polymer |  |  |  |  |
| B1.2b describe DNA as being made up of two strands forming a double helix |  |  |  |  |
| B1.2c describe that DNA is made from four different   nucleotides; each nucleotide consisting of a common sugar and phosphate group with one of four different bases attached to the sugar  *To include* – the pairs of complementary bases (A-T and G-C)  (*separate science only)* |  |  |  |  |

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| **B1.2 What happens in cells (and what do cells need)?** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B1.2d **recall a simple description of protein synthesis**  ***To include* – the unzipping of the DNA  molecule around the gene, copying to  mRNA in nucleus (transcription),  (translation) of the nucleotide sequence, in the cytoplasm, tRNA as the carrier of amino acids**  ***(separate science only)*** |  |  |  |  |
| B1.2e **explain simply how the structure of DNA affects the proteins made in protein synthesis**  ***To include* – triplet code and its use to determine amino acid order in a protein**  ***(separate science only)*** |  |  |  |  |
| B1.2f describe experiments that can be used to investigate enzymatic reactions |  |  |  |  |

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| **B1.2 What happens in cells (and what do cells need)?** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B1.2g explain the mechanism of enzyme action  *To include* – the role of enzymes in metabolism, the role of the active site, enzyme specificity (lock and key hypothesis) and factors affecting the rate of enzyme controlled reactions (pH, temperature, substrate and enzyme concentration) |  |  |  |  |
| **B1.3 Respiration** | | | | |
| B1.3a describe cellular respiration as a universal chemical process, continuously occurring that  supplies ATP in all living cells |  |  |  |  |
| B1.3b describe cellular respiration as an exothermic reaction |  |  |  |  |
| B1.3c compare the processes of aerobic respiration and anaerobic respiration  *To include* – in plants/fungi and animals the different conditions, substrates, products  and relative yields of ATP |  |  |  |  |

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| **B1.3 Respiration** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B1.3d explain the importance of sugars in the synthesis and breakdown of carbohydrates  *To include* – use of the terms monomer and polymer |  |  |  |  |
| B1.3e explain the importance of amino acids in the   synthesis and breakdown of proteins  *To include* – use of the terms monomer and polymer |  |  |  |  |
| B1.3f explain the importance of fatty acids and glycerol in the synthesis and breakdown of lipids. |  |  |  |  |
| **B1.4 Photosynthesis** | | | | |
| B1.4a describe photosynthetic organisms as the main producers of food and therefore biomass for life on Earth |  |  |  |  |

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| **B1.4 Photosynthesis** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B1.4b describe the process of photosynthesis  *To include* – reactants and products, two- stage process, location of the reaction (in  the chloroplasts) |  |  |  |  |
| B1.4c describe photosynthesis as an endothermic reaction |  |  |  |  |
| B1.4d describe experiments to investigate photosynthesis |  |  |  |  |
| B1.4e explain the effect of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis |  |  |  |  |
| B1.4f **explain the interaction of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis**  ***To include –* using graphs depicting the effects of the limiting factors** |  |  |  |  |

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| **B2 Scaling up** | | | | |
| **B2.1 Supplying the cell** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B2.1a explain how substances are transported into and out of cells through diffusion, osmosis and active transport  *To include* – examples of substances moved, direction of movement,   concentration gradients and use of the term  water potential (no mathematical use of  water potential required) |  |  |  |  |
| B2.1b describe the process of mitosis in growth, including the cell cycle.  *To include* – the stages of the cell cycle as cell growth, DNA replication, more cell growth, movement of chromosomes |  |  |  |  |
| B2.1c explain the importance of cell differentiation  *To include* – the production of specialised cells allowing organisms to become more efficient and examples of specialised cells |  |  |  |  |

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| **B2.1 Supplying the cell** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B2.1d recall that stem cells are present in embryonic and adult animals and meristems in plants |  |  |  |  |
| B2.1e describe the functions of stem cells in embryonic and adult animals, and meristems in plants  *To include* – division to produce a range of different cell types for development, growth and repair |  |  |  |  |
| B2.1f describe the difference between embryonic and adult stem cells in animals |  |  |  |  |

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| **B2.2 The challenges of size** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B2.2a explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area : volume ratio  *To include* – calculation of surface area, volume and surface area : volume ratio, and reference to diffusion distances |  |  |  |  |
| B2.2b describe some of the substances transported into and out of a range of organisms in terms of the requirements of those organisms  *To include* – oxygen, carbon dioxide, water, dissolved food molecules, mineral ions and urea |  |  |  |  |
| B2.2c describe the human circulatory system  *To include* – the relationship with the gaseous exchange system, the need for a double circulatory system in mammals and the arrangement of vessels |  |  |  |  |

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| **B2.2 The challenges of size** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B2.2d explain how the structure of the heart and the blood vessels are adapted to their functions  *To include* – the structure of the mammalian heart with reference to the cardiac muscle, the names of the valves, chambers, and blood vessels into and out of the heart, the structure of the blood vessels with reference to thickness of walls, diameter of lumen, presence of valves |  |  |  |  |
| B2.2e explain how red blood cells and plasma are adapted to their transport functions in the blood |  |  |  |  |
| B2.2f explain how water and mineral ions are taken up by plants, relating the structure of the root hair cells to their function |  |  |  |  |
| B2.2g describe the processes of transpiration and translocation  *To include* – the structure and function of the stomata |  |  |  |  |

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| **B2.2 The challenges of size** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B2.2h explain how the structure of the xylem and phloem are adapted to their functions in the plant |  |  |  |  |
| B2.2i explain the effect of a variety of environmental factors on the rate of water update by a plant  *To include* – light intensity, air movement, and temperature |  |  |  |  |
| B2.2j describe how a simple potometer can be used to investigate factors that affect the rate of water uptake  *To include –* calculation of rate and percentage gain/loss of mass |  |  |  |  |

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| **B3 Organism level systems** | | | | |
| **B3.1 Coordination and control – the nervous system** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B3.1a describe the structure of the nervous system  *To include* – Central Nervous System, sensory, motor and relay neurones, sensory receptors, synapse and effectors, details of the structure of sensory and motor neurones required |  |  |  |  |
| B3.1b explain how the components of the nervous system can produce a coordinated response  *To include* – it goes to all parts of the body, has many links, has different sensory receptors and is able to coordinate responses |  |  |  |  |
| B3.1c explain how the structure of a reflex arc is related to its function |  |  |  |  |
| B3.1d explain how the main structures of the eye are related to their functions  *To include* – cornea, iris, pupil, lens, retina, optic nerve, ciliary body, suspensory ligaments  *(separate science only)* |  |  |  |  |
| **B3.1 Coordination and control – the nervous system** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B3.1e describe common defects of the eye and explain how some of these problems may be overcome  *To include* – colour blindness, short- sightedness and long-sightedness  (*separate science only)* |  |  |  |  |
| B3.1f describe the structure and function of the brain  *To include* – cerebrum, cerebellum, medulla, hypothalamus, pituitary  *(separate science only)* |  |  |  |  |
| B3.1g **explain some of the difficulties of investigating brain function**  ***To include* – the difficulty in obtaining and interpreting case studies and the consideration of ethical issues**  ***(separate science only)*** |  |  |  |  |

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| **B3.1 Coordination and control – the nervous system** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B3.1h **explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system**  ***To include* – limited ability to repair nervous tissue, irreversible damage to the surrounding tissues, difficulties with accessing parts of the nervous system**  ***(separate science only)*** |  |  |  |  |
| **B3.2 Coordination and control – the endocrine system** | | | | |
| B3.2a describe the principles of hormonal coordination and control by the human endocrine system  *To include* – use of chemical messengers, transport in blood, endocrine glands and receptors |  |  |  |  |
| B3.2b **explain the roles of thyroxine and adrenaline in the body**  ***To include* – thyroxine as an example of a negative feedback system** |  |  |  |  |

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| **B3.2 Coordination and control – the endocrine system** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B3.2c describe the role of hormones in human reproduction including the control of the menstrual cycle  *To include* – oestrogen, progesterone, FSH and testosterone |  |  |  |  |
| B3.2d **explain the interactions of FSH, LH, oestrogen and progesterone in the control of the menstrual cycle** |  |  |  |  |
| B3.2e explain the use of hormones in contraception and evaluate hormonal and non-hormonal methods of contraception  *To include* – relative effectiveness of the different forms of contraception |  |  |  |  |
| B3.2f **explain the use of hormones in modern reproductive technologies to treat infertility** |  |  |  |  |

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| **B3.2 Coordination and control – the endocrine system** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B3.2g explain how plant hormones are important in the control and coordination of plant growth and development, with reference to the role of auxins in phototropisms and gravitropisms  *To include* – unequal distribution of auxin  *(separate science only)* |  |  |  |  |
| B3.2h describe some of the variety of effects of plant hormones, relating to auxins, **gibberellins and ethene**  *To include* – controlling growth, **controlling germination, fruit ripening, flower opening and shedding of leaves**  *(separate science only)* |  |  |  |  |
| B3.2i **describe some of the different ways in which people use plant hormones to control plant growth**  ***To include* – selective herbicides, root cuttings, seedless fruit (parthenocarpic fruit development), altering dormancy**  ***(separate science only)*** |  |  |  |  |

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| **B3.3 Maintaining internal environments** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B3.3a explain the importance of maintaining a constant internal environment in response to internal and external change  *To include* – allowing metabolic reactions to proceed at appropriate rates |  |  |  |  |
| B3.3b describe the function of the skin in the control of body temperature  *To include* – detection of external temperature, sweating, shivering, change to blood flow in terms of vasoconstriction and vasodilation  *(separate science only)* |  |  |  |  |
| B3.3c explain how insulin controls blood sugar levels in the body |  |  |  |  |
| B3.3d **explain how glucagon interacts with insulin to control blood sugar levels in the body** |  |  |  |  |

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| **B3.3 Maintaining internal environments** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B3.3e compare type 1 and type 2 diabetes and explain how they can be treated |  |  |  |  |
| B3.3f explain the effects on cells of osmotic changes in body fluids  *To include* – higher, lower or equal water potentials leading to lysis or shrinking (no mathematical use of water potentials required)  *(separate science only)* |  |  |  |  |
| B3.3g describe the function of the kidneys in maintaining the water balance of the bod  *To include* – varying the amount and concentration of urine and hence water excreted  (*separate science only)* |  |  |  |  |

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| **B3.3 Maintaining internal environments** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B3.3h describe the gross structure of the kidney and the structure of the kidney tubule  *To include –* Bowman’s capsule, proximal convoluted tubule, loop of Henlé and collecting duct  *(separate science only)* |  |  |  |  |
| B3.3i **describe the effect of ADH on the permeability of the kidney tubules**  ***To include* – amount of water reabsorbed and negative feedback**  ***(separate science only)*** |  |  |  |  |
| B3.3j **explain the response of the body to different temperature and osmotic challenges**  ***To include* – challenges to include high sweating and dehydration, excess water intake, high salt intake responses to include mechanism of kidney function, thirst**  ***(separate science only)*** |  |  |  |  |

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| **B4 Community level systems** | | | | |
| **B4.1 Ecosystems** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B4.1a recall that many different materials cycle through abiotic and biotic components of an ecosystem  *To include* – examples of cycled materials   e.g. nitrogen and carbon |  |  |  |  |
| B4.1b explain the role of microorganisms in the cycling of materials through an ecosystem  *To include* – the role of microorganisms in decomposition |  |  |  |  |
| B4.1c explain the importance of the carbon cycle and the water cycle to living organism  *To include* – maintaining habitats, fresh water, flow of nutrients and the stages of the carbon and water cycles |  |  |  |  |

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| **B4.1 Ecosystems** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B4.1d explain the effect of factors such as temperature, water content, and oxygen availability on rate of decomposition  *To include –* the terms aerobic and anaerobic  *(separate science only)* |  |  |  |  |
| B4.1e describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem |  |  |  |  |
| B4.1f explain how abiotic and biotic factors can affect communities  *To include* – temperature, light intensity, moisture level, pH of soil, predators, food |  |  |  |  |
| B4.1g describe the importance of interdependence and competition in a community  *To include* – interdependence relating to predation, mutualism and parasitism |  |  |  |  |
| **B4.1 Ecosystems** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B4.1h describe the differences between the trophic levels of organisms within an ecosystem  *To include –* use of the terms producer and consumer  *(separate science only)* |  |  |  |  |
| B4.1i describe pyramids of biomass and explain, with examples, how biomass is lost between the different trophic levels  *To include –* loss of biomass related to egestion, excretion, respiration  *(separate science only)* |  |  |  |  |
| B4.1j calculate the efficiency of biomass transfers between trophic levels and explain how this affects the number of trophic levels in a food chain  *(separate science only)* |  |  |  |  |

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| **B5 Genes, inheritance and selection** | | | | |
| **B5.1 Inheritance** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B5.1a explain the following terms: gamete, chromosome, gene, allele/variant, dominant, recessive, homozygous, heterozygous, genotype and phenotype |  |  |  |  |
| B5.1b describe the genome as the entire genetic material of an organism |  |  |  |  |
| B5.1c describe that the genome, and its interaction with the environment, influence the development of the phenotype of an organisation  *To include* – use examples of discontinuous (e.g. eye colour) and continuous variation (e.g. weight and height) |  |  |  |  |
| B5.1d recall that all variants arise from mutations, and that most have no effect on the phenotype, some influence phenotype and a very few determine phenotype |  |  |  |  |
| **B5.1 Inheritance** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B5.1e **describe how genetic variants may influence phenotype:**   * **in coding DNA by altering activity of a protein** * **in non-coding DNA by altering how genes are expressed**   ***To include* –**   * + **in coding: DNA related to mutations affecting protein structure, including active sites of enzymes**   + **in non-coding: DNA relating to stopping transcription of mRNA (use of terms promoter, transcription factor not required)**   ***(separate science only)*** |  |  |  |  |

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| **B5.1 Inheritance** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B5.1f explain some of the advantages and disadvantages of asexual and sexual reproduction in a range of organisms  *To include* – the number of live offspring per birth, how quickly the organisms can reproduce verses the need for the introduction of variation in a population caused by environmental pressures  *(separate science only)* |  |  |  |  |
| B5.1g explain the terms of haploid and diploid |  |  |  |  |
| B5.1h explain the role of meiotic cell division in halving the chromosome number to form gametes  *To include* – that this maintains diploid cells when gametes combine and is a source of genetic variation. |  |  |  |  |

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| **B5.1 Inheritance** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B5.1i explain single gene inheritance  *To include* – the context of homozygous and heterozygous crosses involving dominant and recessive genes |  |  |  |  |
| B5.1j predict the results of single gene crosses  *To include –* the use of Punnett squares |  |  |  |  |
| B5.1k describe sex determination in humans using a genetic cross  *To include –* the use of Punnett squares |  |  |  |  |
| B5.1l recall that most phenotypic features are the result of the multiple genes rather than single gene inheritance |  |  |  |  |
| B5.1m describe the development of our understanding of genetics  *To include* – the work of Mendel  *(separate science only)* |  |  |  |  |
| **B5.2 Natural selection and evolution** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B5.2a state that there is usually extensive genetic variation within a population of a species |  |  |  |  |
| B5.2b describe the impact of developments in biology on classification systems  *To include* – natural and artificial classification systems and use of molecular phylogenetics based on DNA sequencing |  |  |  |  |
| B5.2c explain how evolution occurs through the natural selection of variants that have given rise to phenotypes best suited to their environment  *To include* – the concept of mutation |  |  |  |  |
| B5.2d describe evolution as a change in the inherited characteristics of a population over time, through a process of natural selection, which may result in the formation of new species |  |  |  |  |

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| **B5.2 Natural selection and evolution** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B5.2e describe the evidence for evolution  *To include* – fossils and antibiotic resistance in bacteria |  |  |  |  |
| B5.2f describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection and explain the impact of these ideas on modern biology  *To include* – seedbanks being used as a store of biodiversity  (*separate science only)* |  |  |  |  |

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| **B6 Global challenges** | | | | |
| **B6.1 Monitoring and maintaining the environment** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.1a explain how to carry out a field investigation into the distribution and abundance of organisms in a habitat and how to determine their numbers in a given area  *To include* – sampling techniques (random and transects, capture-recapture), use of quadrats, pooters, nets, keys and scaling up methods |  |  |  |  |
| B6.1b describe both positive and negative human interactions within ecosystems and explain their impact on biodiversity  *To include* – the conservation of individual species and selected habitats and threats from land use and hunting |  |  |  |  |

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| **B6.1 Monitoring and maintaining the environment** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.1c explain some of the benefits and challenges of maintaining local and global biodiversity  *To include* – the difficulty in gaining agreements for and the monitoring of conservation schemes along with the benefits of ecotourism |  |  |  |  |
| B6.1d **evaluate the evidence for the impact of environmental changes on the distribution of organisms, with reference to water and atmospheric gases**  ***(separate science only)*** |  |  |  |  |

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| **B6.2 Feeding the human race** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.2a describe some of the biological factors affecting levels of food security  *To include* – increasing human population, changing diets in wealthier populations, new pests and pathogens, environmental change, sustainability and cost of agricultural inputs  (*separate science only)* |  |  |  |  |
| B6.2b describe and explain some possible agricultural solutions to the demands of the growing human population  *To include* – increased use of hydroponics, biological control, gene technology, fertilisers and pesticide  *(separate science only)* |  |  |  |  |
| B6.2c explain the impact of the selective breeding of food plants and domesticated animals |  |  |  |  |

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| **B6.2 Feeding the human race** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.2d describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics |  |  |  |  |
| B6.2e **describe the main steps in the process of genetic engineering**  ***To include* – restriction enzymes, sticky ends, ligase, host bacteria and selection using antibiotic resistance markers, vectors e.g. plasmids** |  |  |  |  |
| B6.2f explain some of the possible benefits and risks of using gene technology in modern agriculture  *To include* – practical and ethical considerations |  |  |  |  |
| B6.2g describe and explain some possible biotechnological solutions to the demands of the growing human population  *To include* – genetic modification  *(separate science only)* |  |  |  |  |

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| **B6.3 Monitoring and maintaining health** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.3a describe the relationship between health and disease |  |  |  |  |
| B6.3b describe different types of diseases  *To include* – communicable and non- communicable diseases |  |  |  |  |
| B6.3c describe the interactions between different types of disease  *To include* – HIV and tuberculosis; HPV and cervical cancer |  |  |  |  |
| B6.3d explain how communicable diseases (caused by viruses, bacteria, protists and fungi) are spread in animals and plants  *To include* – scientific quantities, number of pathogens, number of infected cases, estimating number of cases |  |  |  |  |

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| **B6.3 Monitoring and maintaining health** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.3e explain how the spread of communicable diseases may be reduced or prevented in animals and plants  *To include* – detection of the antigen, DNA testing, visual identification of the disease |  |  |  |  |
| B6.3f describe a minimum of one common human infection, one plant disease and sexually transmitted infections in humans including HIV/AIDS  *To include* – human infections: one example of each viral, fungal, bacterial  plant diseases: virus tobacco mosaic virus (TMV), fungal *Erysiphe graminis* (barley powdery mildew), bacterial *Agrobacterium tumefaciens (*crown gall disease) |  |  |  |  |
| B6.3g describe physical plant defence responses to disease  *To include* – leaf cuticle, cell wall  *(separate science only)* |  |  |  |  |

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| **B6.3 Monitoring and maintaining health** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.3h describe chemical plant defence responses  *To include* – antimicrobial substances  (*separate science only)* |  |  |  |  |
| B6.3i **describe different ways plant diseases can be detected and identified, in the lab and in the field**  ***To include* – the laboratory detection of the DNA or antigen from the disease causing organism. The field diagnosis by observation and microscopy**  ***(separate science only)*** |  |  |  |  |
| B6.3j explain how white blood cells and platelets are adapted to their defence functions in the blood |  |  |  |  |
| B6.3k describe the non-specific defence systems of the human body against pathogens |  |  |  |  |

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| **B6.3 Monitoring and maintaining health** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.3l explain the role of the immune system of the human body in defence against disease |  |  |  |  |
| B6.3m **describe how monoclonal antibodies are produced**  **(*separate science only)*** |  |  |  |  |
| B6.3n **describe some of the ways in which monoclonal antibodies can be used**  ***To include* – their role in detecting antigens in pregnancy testing, detection of diseases (prostate cancer) and potentially treating disease (targeting cancer cells)**  ***(separate science only)*** |  |  |  |  |
| B6.3o explain the use of vaccines and medicines in the prevention and treatment of disease  *To include* – antibiotics, antivirals and antiseptics |  |  |  |  |

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| **B6.3 Monitoring and maintaining health** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.3p explain the aseptic techniques used in culturing organisms  *To include* – use of alcohol, flaming, autoclaving of glassware and growth media, and measures used to stop contaminants falling onto/into the growth media (e.g. working around a Bunsen burner)  *(separate science only)* |  |  |  |  |
| B6.3q describe the process of discovery and development of potential new medicines  *To include* – preclinical and clinical testing |  |  |  |  |
| B6.3r recall that many non-communicable human diseases are caused by the interaction of a number of factors  *To include* – cardiovascular diseases, many forms of cancer, some lung (bronchitis) and liver (cirrhosis) diseases and diseases influenced by nutrition, including type 2 diabetes |  |  |  |  |

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| **B6.3 Monitoring and maintaining health** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.3s evaluate some different treatments for cardiovascular disease  *To include* – lifestyle, medical and surgical |  |  |  |  |
| B6.3t analyse the effect of lifestyle factors on the incidence of non-communicable diseases at local, national and global levels  *To include* – lifestyle factors to include exercise, diet, alcohol and smoking |  |  |  |  |
| B6.3u describe cancer as the result of changes in cells that lead to uncontrolled growth and division |  |  |  |  |
| B6.3v discuss potential benefits and risks associated with the use of stem cells in medicine  *To include* – tissue transplantation and rejection |  |  |  |  |

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| **B6.3 Monitoring and maintaining health** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |
| B6.3w explain some of the possible benefits and risks of using gene technology in medicine  *To include* – practical and ethical considerations |  |  |  |  |
| B6.3x discuss the potential importance for medicine of our increasing understanding of the human genome  *To include* – the ideas of predicting the likelihood of diseases occurring and their treatment by drugs which are targeted to genomes |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.1 Development of scientific thinking** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 1.1a understand how scientific methods and theories develop over time  *To include* – new technology allowing new evidence to be collected and changing explanations as new evidence is found |  |  |  |  |
| 1.1b use models to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts  *To include* – representational, spatial, descriptive, computational and mathematical models |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.1 Development of scientific thinking** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 1.1c understand the power and limitations of science  *To include* – how developments in science have led to increased understanding and improved quality of life and questions and problems that science cannot currently answer |  |  |  |  |
| 1.1d discuss ethical issues arising from developments in science |  |  |  |  |
| 1.1e explain every day and technological applications of science |  |  |  |  |
| 1.1f evaluate associated personal, social, economic and environmental implications |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.1 Development of scientific thinking** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 1.1g make decisions based on the evaluation of evidence and arguments |  |  |  |  |
| 1.1h evaluate risks both in practical science and the wider societal context  *To include* – perception of risk in relation to data and consequences |  |  |  |  |
| 1.1i recognise the importance of peer review of results and of communicating results to a range of audiences |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.2 Experimental skills and strategies** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 1.2a use scientific theories and explanations to develop hypotheses |  |  |  |  |
| 1.2b plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena |  |  |  |  |
| 1.2c apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment |  |  |  |  |
| 1.2d recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative |  |  |  |  |
| 1.2e evaluate methods and suggest possible improvements and further investigations |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.3 Analysis and evaluation** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| Appy the cycle of collecting, presenting and analysing data, including: |  |  |  |  |
| 1.3a presenting observations and other data using appropriate methods  *To include –* methods to include descriptive, tabular diagrammatic and graphically |  |  |  |  |
| 1.3b translating data from one form to another |  |  |  |  |
| 1.3c carrying out and representing mathematical and statistical analysis  *To include* – statistical analysis to include arithmetic means, mode, median |  |  |  |  |
| 1.3d representing distributions of results and make estimations of uncertainty |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.3 Analysis and evaluation** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 1.3e interpreting observations and other data  *To include* – data presentations to include verbal, diagrammatic, graphical, symbolic or numerical form interpretations to include identifying patterns and trends, making inferences and drawing conclusions |  |  |  |  |
| 1.3f presenting reasoned explanations  *To include* – relating data to hypotheses |  |  |  |  |
| 1.3g being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.3 Analysis and evaluation** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 1.3h identifying potential sources of random and systematic error |  |  |  |  |
| 1.3i communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions  *To include* – presentations through paper- based presentations using diagrammatic, graphical, numerical and symbolic forms |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.4 Scientific vocabulary, quantities, units, symbols and nomenclature** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 1.4a use scientific vocabulary, terminology and definitions |  |  |  |  |
| 1.4b recognise the importance of scientific quantities and understand how they are determined |  |  |  |  |
| 1.4c use SI units and IUPAC chemical nomenclature unless inappropriate  *To include* – base units & derived units |  |  |  |  |
| 1.4d use prefixes and powers of ten for orders of magnitude  *To include* – tera, giga, mega, kilo, deci, centi, milli, micro and nano |  |  |  |  |
| 1.4e interconvert units |  |  |  |  |

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| **WS1 Working scientifically assessed in written examinations** | | | | |
| **WS1.4 Scientific vocabulary, quantities, units, symbols and nomenclature** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 1.4f use an appropriate number of significant figures in calculation |  |  |  |  |

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| **WS2 Working scientifically skills demonstrated** | | | | |
| **Practical skills to be developed** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 2a carry out experiments  *To include* – due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations, and following written instructions. |  |  |  |  |
| 2b make and record observations and measurements using a range of apparatus and methods  *To include* – keeping appropriate records |  |  |  |  |
| 2c presenting observations using appropriate methods  *To include* – methods to include descriptive, tabular diagrammatic and graphically |  |  |  |  |

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| **WS2 Working scientifically skills demonstrated** | | | | |
| **Practical skills to be developed** | | | | |
| **Learning outcomes**  You will be required to: | **R** | **A** | **G** | **Comments** |

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| 2d communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions  *To include* – presentations through paper- based and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms |  |  |  |  |

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