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| **Edexcel Biology (1BI0) from 2016 Topic B1** |
| **Topic**  | **Student Checklist** | **R** | **A** | **G** |
| **Topic 1 – Key concepts in biology** | Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions, including: animal, plant & bacteria |  |  |  |
| Explain how specialised cells are adapted to their functions, including: sperm, egg and ciliated epithelial cells |  |  |  |
| Explain how changes in microscope technology, including electron microscopy, have enabled us to see cell structures with more clarity and detail than in the past  |  |  |  |
| Demonstrate an understanding of number, size and scale, including the use of estimations and explain when they should be used  |  |  |  |
| Demonstrate an understanding of the relationship between quantitative units in relation to cells, including: milli, micro, nano & pico |  |  |  |
| **HT ONLY: Complete calculations with numbers written in standard form** |  |  |  |
| *Core Practical: Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations*  |  |  |  |
| Explain the mechanism of enzyme action including the active site and enzyme specificity |  |  |  |
| Explain how enzymes can be denatured due to changes in the shape of the active site |  |  |  |
| Explain the effects of temperature, substrate concentration and pH on enzyme activity  |  |  |  |
| *Core Practical: Investigate the effect of pH on enzyme activity*  |  |  |  |
| Demonstrate an understanding of rate calculations for enzyme activity  |  |  |  |
| Demonstrate an understanding of rate calculations for enzyme activity  |  |  |  |
| Explain the importance of enzymes as biological catalysts in the synthesis and breakdown of carbohydrates, fats and proteins |  |  |  |
| *Bio ONLY: Core Practical: Investigate the use of chemical reagents to identify starch, reducing sugars, proteins and fats* |  |  |  |
| Bio ONLY: Explain how the energy contained in food can be measured using calorimetry  |  |  |  |
| Explain how substances are transported into and out of cells, including by diffusion, osmosis and active transport |  |  |  |
| *Core Practical: Investigate osmosis in potatoes* |  |  |  |
| Calculate percentage gain and loss of mass in osmosis |  |  |  |

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| **Edexcel Biology (1BI0) from 2016 Topic B2** |
| **Topic**  | **Student Checklist** | **R** | **A** | **G** |
| **Topic 2 – Cells and control** | Describe mitosis as part of the cell cycle, including the stages interphase, prophase, metaphase, anaphase and telophase and cytokinesis  |   |   |   |
| Describe the importance of mitosis in growth, repair and asexual reproduction  |   |   |   |
| Describe the division of a cell by mitosis in terms of cells formed and chromosome numbers |   |   |   |
| Describe cancer as the result of changes in cells that lead to uncontrolled cell division  |   |   |   |
| Describe growth in plants and animals including: cell division, differentiation and elongation (plants only) |   |   |   |
| Explain the importance of cell differentiation in the development of specialised cell |   |   |   |
| Demonstrate an understanding of the use of percentiles charts to monitor growth |   |   |   |
| Describe the function of embryonic stem cells in animals and meristems in plants |   |   |   |
| Discuss the potential benefits and risks associated with the use of stem cells in medicine  |   |   |   |
| Bio ONLY: Describe the structures and functions of the brain including the cerebellum, cerebral hemispheres and medulla oblongata  |   |   |   |
| **Bio & HT ONLY: Explain how the difficulties of accessing brain tissue inside the skull can be overcome by using CT scanning and PET scanning**  |   |   |   |
| **Bio & HT ONLY: Explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system** |   |   |   |
| Explain the structure and function of the nervous system including neurones, synapses and neurotransmitters |   |   |   |
| Explain the structure and function of a reflex arc including sensory, relay and motor neurones  |   |   |   |
| Bio ONLY: Explain the structure and function of the eye as a sensory receptor including the role of: cornea, lens, iris, rod and cone cells |   |   |   |
| Bio ONLY: Describe defects of the eye including cataracts, long-sightedness, short-sightedness and colour blindness  |   |   |   |

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| **Edexcel Biology (1BI0) from 2016 Topic B3** |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 3 – Genetics** | Bio ONLY: Explain how cataracts, long-sightedness and short-sightedness can be corrected |   |   |   |
| Bio ONLY: Explain some of the advantages and disadvantages of asexual reproduction |   |   |   |
| Bio ONLY: Explain some of the advantages and disadvantages of sexual reproduction |   |   |   |
| Explain the role of meiotic cell division in terms of cells formed and chromosome numbers |   |   |   |
| Describe the structure of DNA in terms of bases and bonding  |   |   |   |
| Describe what a genome and gene are and describe the role of a gene |   |   |   |
| Explain how DNA can be extracted from fruit  |   |   |   |
| **Bio & HT ONLY: Explain how the order of bases in a section of DNA decides the order of amino acids and how this determines the shape of the protein** |   |   |   |
| **Bio & HT ONLY: Describe the stages of protein synthesis, including transcription and translation:**  |   |   |   |
| **Bio & HT ONLY: Describe how genetic variants in the non-coding DNA of a gene can affect phenotype**  |   |   |   |
| **Bio & HT ONLY: Describe how genetic variants in the coding DNA of a gene can affect phenotype**  |   |   |   |
| Bio ONLY: Describe the work of Mendel in discovering the basis of genetics and recognise the difficulties of understanding inheritance before this discovery |   |   |   |
| Explain why there are differences in the inherited characteristics as a result of alleles  |   |   |   |
| Explain the terms: chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype, gamete and zygote  |   |   |   |
| Explain monohybrid inheritance using genetic diagrams, Punnett squares and family pedigrees  |   |   |   |
| Describe how the sex of offspring is determined at fertilisation, using genetic diagrams |   |   |   |
| Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses and pedigree analysis for dominant and recessive traits |   |   |   |
| Bio ONLY: Describe the inheritance of the ABO blood groups with reference to codominance and multiple alleles  |   |   |   |
| **Bio & HT ONLY: Explain how sex-linked genetic disorders are inherited**  |   |   |   |
| State that most phenotypic features are the result of multiple genes rather than single gene inheritance  |   |   |   |
| Describe the causes of variation that influence phenotype: genetic/environmental variation and mutations |   |   |   |
| Discuss the outcomes of the Human Genome Project and its potential applications within medicine  |   |   |   |
| State that there is usually extensive genetic variation within a population of a species and that these arise through mutations |   |   |   |

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| **Edexcel Chemistry (1CI0) from 2016 Topic C1a&b** |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 1a – Key concepts in chemistry Edexcel Single Chemistry (1CI0) from 2016 Topic C1a&b** | Describe how the Dalton model of an atom has changed over time because of the discovery of subatomic particles |   |   |   |
| Describe the structure of an atom as a nucleus containing protons and neutrons, surrounded by electrons in shells |   |   |   |
| Recall the relative charge and relative mass of: a proton, a neutron and an electron  |   |   |   |
| Explain why atoms contain equal numbers of protons and electrons |   |   |   |
| Describe the nucleus of an atom as very small compared to the overall size of the atom |   |   |   |
| Recall that most of the mass of an atom is concentrated in the nucleus |   |   |   |
| Recall the meaning of the term mass number of an atom |   |   |   |
| Describe atoms of a given element as having the same number of protons in the nucleus and that this number is unique  |   |   |   |
| Describe what isotopes are |   |   |   |
| Calculate the numbers of protons, neutrons and electrons in atoms given the atomic number and mass number |   |   |   |
| Explain how the existence of isotopes results in relative atomic masses of some elements not being whole numbers |   |   |   |
| **HT ONLY: Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes** |   |   |   |
| Describe how Mendeleev arranged the elements known at that time, in a periodic table by using properties of these elements and their compounds |   |   |   |
| Describe how Mendeleev used his table to predict the existence and properties of some elements not discovered by then |   |   |   |
| Explain that Mendeleev thought he had arranged elements in order of increasing relative atomic mass but this was not always true  |   |   |   |
| Explain the meaning of atomic number of an element in terms of position in the periodic table and number of protons in the nucleus |   |   |   |
| Describe how elements are arranged in the groups and periods of the periodic table |   |   |   |
| Identify elements as metals or non-metals according to their position in the periodic table, explaining this division in terms of atomic structure |   |   |   |
| Predict the electronic configurations of the first 20 elements in the periodic table as diagrams and in the form 2.8.1 etc |   |   |   |
| Explain how the electronic configuration of an element is related to its position in the periodic table |   |   |   |
| Explain how ionic bonds are formed to produce cations and anions, including the use of dot and cross diagrams |   |   |   |
| Recall that an ion is an atom or group of atoms with a positive or negative charge |   |   |   |
| Calculate the numbers of protons, neutrons and electrons in simple ions given the atomic number and mass number |   |   |   |
| Explain the formation of ions in ionic compounds from their atoms, limited to compounds of elements in groups 1, 2, 6 and 7 |   |   |   |
| Explain the use of the endings –ide and –ate in the names of compounds |   |   |   |
| Deduce the formulae of ionic compounds given the formulae of the constituent ions |   |   |   |
| Explain the structure of an ionic compound including a description of the lattice and electrostatic forces |   |   |   |

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| **Edexcel Chemistry (1CI0) from 2016 Topic C1b** |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 1b – Key concepts in chemistry** | Explain how a covalent bond is formed when a pair of electrons is shared between two atoms |   |   |   |
| Recall that covalent bonding results in the formation of molecules |   |   |   |
| Recall the typical size (order of magnitude) of atoms and small molecules |   |   |   |
| Explain the formation of simple molecular, covalent substances, using dot and cross diagrams, including: H, HCl, H20, CH4, O2, CO2 |   |   |   |
| Explain why elements and compounds can be classified as: ionic, simple molecular (covalent), giant covalent and metallic |   |   |   |
| Explain how the structure and bonding of substances results in different physical properties |   |   |   |
| Explain the properties of ionic compounds limited to: melting/boiling points, forces between ions and conductivity  |   |   |   |
| Explain the properties of typical covalent, simple molecular compounds limited to: melting/boiling points, forces between ions and conductivity |   |   |   |
| Recall that graphite and diamond are different forms of carbon and that they are examples of giant covalent substances |   |   |   |
| Describe the structures of graphite and diamond |   |   |   |
| Explain, in terms of structure and bonding, why graphite and diamond have different uses |   |   |   |
| Explain the properties of fullerenes including C60 and graphene in terms of their structures and bonding |   |   |   |
| Describe, using poly(ethene) as the example, that simple polymers consist of large molecules containing chains of carbon atoms |   |   |   |
| Explain the properties of metals, including malleability and the ability to conduct electricity |   |   |   |
| Describe the limitations of particular representations and models, to include dot & cross, ball & stick models & 2/3D  |   |   |   |
| Describe the properties of most metals |   |   |   |

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| **Edexcel Chemistry (1CI0) from 2016 Topic C2** |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 2 – States of matter and mixtures States of matter** | Describe the arrangement, movement and the relative energy of particles in each of the three states of matter |   |   |   |
| Recall the names used for the interconversions between the three states of matter |   |   |   |
| Compare physical changes with chemical reactions |   |   |   |
| Explain the changes in arrangement, movement and energy of particles during these interconversions |   |   |   |
| Predict the physical state of a substance under specified conditions, given suitable data |   |   |   |
| Explain the difference between the use of ‘pure’ in chemistry compared with its everyday use and the differences between a pure substance and a mixture |   |   |   |
| Interpret melting point data to distinguish between pure substances and mixtures |   |   |   |
| Explain the experimental techniques for separation of mixtures by: simple & fractional distillation, filtration, crystallisation and paper chromatography |   |   |   |
| Describe an appropriate experimental technique to separate a mixture when knowing the properties  |   |   |   |
| Describe what paper chromatography is and explain how it can be used to separate a mixture |   |   |   |
| Interpret a paper chromatogram: to distinguish between pure and impure substances |   |   |   |
| Interpret a paper chromatogram: to identify substances by comparison with known substances |   |   |   |
| Interpret a paper chromatogram: to identify substances by calculation and use of Rf values |   |   |   |
| *Core Practical: Investigate the composition of inks using simple distillation and paper chromatography* |   |   |   |
| Describe how: waste and ground water can be made potable, including the need for sedimentation, filtration and chlorination |   |   |   |
| Describe how: sea water can be made potable by using distillation |   |   |   |
| Describe how: water used in analysis must not contain any dissolved salts |   |   |   |

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| **Edexcel Chemistry (1CI0) from 2016 Topic C3** |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 3 – Chemical changes** | Recall that acids in solution are sources of hydrogen ions and alkalis in solution are sources of hydroxide ions |   |   |   |
| Recall that the pH values of acids, alkalis and neutral  |   |   |   |
| Recall the effect of acids and alkalis on indicators, including litmus, methyl orange and phenolphthalein |   |   |   |
| **HT ONLY: Recall what the higher the concentration of hydrogen ions and hydroxide ions in a solution does to the pH of a solution** |   |   |   |
| **HT ONLY: Recall that as hydrogen ion concentration in a solution increases by a factor of 10, the pH of the solution decreases by 1** |   |   |   |
| *Core Practical: Investigate the change in pH on adding powdered calcium hydroxide or calcium oxide to a dilute hydrochloric acid* |   |   |   |
| **HT ONLY: Explain the terms dilute and concentrated, with respect to amount of substances in solution** |   |   |   |
| **HT ONLY: Explain the terms weak and strong acids, with respect to the degree of dissociation into ions** |   |   |   |
| Recall what is formed when a base of any substance reacts with an acid  |   |   |   |
| Recall what alkalis and bases are |   |   |   |
| Explain the general reactions of aqueous solutions of acids with: metals, metal oxides, metal hydroxides and metal carbonates |   |   |   |
| Describe the chemical test for: hydrogen and carbon dioxide (using limewater) |   |   |   |
| Describe a neutralisation reaction as a reaction between an acid and a base |   |   |   |
| Explain an acid-alkali neutralisation as a reaction in which in terms of the reaction between hydrogen and hydroxide ions  |   |   |   |
| Explain why, when soluble salts are prepared from an acid and an insoluble reactant: excess reactant is added and excess insoluble reactant is removed |   |   |   |
| Explain why, if soluble salts are prepared from an acid and a soluble reactant: titration must be used and what is left after the reaction is only salt and water |   |   |   |
| *Core Practical: Investigate the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide including the use of a water bath* |   |   |   |
| Describe how to carry out an acid-alkali titration, using burette, pipette and a suitable indicator, to prepare a pure, dry salt |   |   |   |
| Recall the general rules which describe the solubility of all common sodium, potassium and ammonium salts |   |   |   |
| Recall the general rules which describe the solubility of all nitrates  |   |   |   |
| Recall the general rules which describe the solubility of common chlorides (except those of silver and lead) |   |   |   |
| Recall the general rules which describe the solubility of common sulfates (except those of lead, barium and calcium) |   |   |   |
| Recall the general rules which describe the solubility of common carbonates and hydroxides (except those of sodium, potassium and ammonium) |   |   |   |
| Predict, using solubility rules, whether or not a precipitate will be formed when named solutions are mixed together, naming the precipitate if any is formed |   |   |   |
| Describe the method used to prepare a pure, dry sample of an insoluble salt |   |   |   |

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| **Edexcel Physics (1PI0) from 2016 Topics P1&2** |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 1 – Key concepts** | Recall and use the SI unit for physical quantities, as listed in the specification |   |   |   |
| Recall and use multiples and sub-multiples of units, including giga (G), mega (M), kilo (k), centi (c), milli (m), micro (μ) and nano (n) |   |   |   |
| Be able to convert between different units, including hours to seconds |   |   |   |
| Use significant figures and standard form where appropriate |   |   |   |
| **Topic 2 – Motion and forces** | Describe what scalar and vector quantities are and explain the differences |   |   |   |
| Recall vector and scalar quantities, including: displacement/distance, velocity/speed, acceleration, force, weight/mass, momentum and energy |   |   |   |
| Define what velocity is |   |   |   |
| Recall and use the equations: (average) speed (metre per second, m/s) = distance (metre, m) ÷ time (s) |   |   |   |
| Recall and use the equation: distance travelled (metre, m) = average speed (metre per second, m/s) × time (s) |   |   |   |
| Analyse distance/time graphs including determination of speed from the gradient |   |   |   |
| Recall and use the equation: ***a=(v-u)/t*** |   |   |   |
| Use the equation: ***v2 − u2 = 2× a× x*** |   |   |   |
| Analyse velocity/time graphs to: compare acceleration from gradients qualitatively |   |   |   |
| Analyse velocity/time graphs to: calculate the acceleration from the gradient (for uniform acceleration only) |   |   |   |
| Analyse velocity/time graphs to: determine distance travelled using area between the graph line and the axis (for uniform acceleration only) |   |   |   |
| Describe a range of laboratory methods for determining the speeds of objects such as the use of light gates |   |   |   |
| Recall some typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systems |   |   |   |
| Recall Newton’s first law and use it where the resultant force on a body is zero |   |   |   |
| Recall Newton’s first law and use it where the resultant force is not zero |   |   |   |
| Recall and use Newton’s second law as: ***F = m x a*** |   |   |   |
| Define weight, recall and use the equation: ***W = m x g*** |   |   |   |
| Describe how weight is measured |   |   |   |
| Describe the relationship between the weight of a body and the gravitational field strength |   |   |   |
| *Core Practical: Investigate the relationship between force, mass and acceleration by varying the masses added to trolleys* |   |   |   |
| **HT ONLY: Explain that an object moving in a circular orbit at constant speed has a changing velocity** |   |   |   |
| **HT ONLY: Explain that for motion in a circle there must be a resultant force known as a centripetal force that acts towards the centre of the circle** |   |   |   |
| **HT ONLY: Explain that inertial mass is a measure of how difficult it is to change the velocity of an object** |   |   |   |
| Recall and apply Newton’s third law both to equilibrium situations |   |   |   |
| **HT ONLY: Recall and apply Newton’s third law collision interactions and relate it to the conservation of momentum in collisions** |   |   |   |
| **HT ONLY: Define momentum, recall and use the equation: *p = m x v*** |   |   |   |
| **HT ONLY: Describe examples of momentum in collisions** |   |   |   |
| **HT ONLY: Use Newton’s second law as: *F = (mv - mu)/t*** |   |   |   |
| Explain methods of measuring human reaction times and recall typical results |   |   |   |
| Recall what the stopping distance of a vehicle is the sum of |   |   |   |
| Explain that the stopping distance of a vehicle is affected by a range of factors and name the factors |   |   |   |
| Describe the factors that could affect a driver’s reaction time |   |   |   |
| Explain the dangers caused by large decelerations |   |   |   |
| **HT ONLY: Estimate the forces involved in typical situations on a public road due to decelerations** |   |   |   |
| Estimate how the distance required for a road vehicle to stop in an emergency varies over a range of typical speeds |   |   |   |
| Carry out calculations on work done to show the dependence of braking distance for a vehicle on initial velocity squared |   |   |   |

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| **Edexcel Physics (1PI0) from 2016 Topic P3** |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 3 – Conservation of energy** | Recall and use the equation to calculate the change in gravitational PE when an object is raised above the ground: ***ΔGPE = m× g ×Δh*** |   |   |   |
| Recall and use the equation to calculate the amounts of energy associated with a moving object: ***KE = ½ × m × v2*** |   |   |   |
| Draw and interpret diagrams to represent energy transfers |   |   |   |
| Explain what is meant by conservation of energy |   |   |   |
| Analyse the changes involved in the way energy is stored when a system changes for an object projected upwards or up a slope |   |   |   |
| Analyse the changes involved in the way energy is stored when a system changes for a moving object hitting an obstacle |   |   |   |
| Analyse the changes involved in the way energy is stored when a system changes for an object being accelerated by a constant force |   |   |   |
| Analyse the changes involved in the way energy is stored when a system changes for a vehicle slowing down |   |   |   |
| Analyse the changes involved in the way energy is stored when a system changes for bringing water to a boil in an electric kettle |   |   |   |
| Explain that where there are energy transfers in a closed system there is no net change to the total energy in that system |   |   |   |
| Explain that mechanical processes become wasteful when they cause a rise in temperature so dissipating energy in heating the surroundings |   |   |   |
| Explain, using examples, how in all system changes energy is dissipated so that it is stored in less useful ways |   |   |   |
| Explain ways of reducing unwanted energy transfer including through lubrication, thermal insulation |   |   |   |
| Describe the effects of the thickness and thermal conductivity of the walls of a building on its rate of cooling qualitatively |   |   |   |
| Recall and use the equation: efficiency = useful energy transferred / total energy supplied |   |   |   |
| **HT ONLY: Explain how efficiency can be increased** |   |   |   |
| Describe the main energy sources available for use on Earth and compare the ways in which both renewable and non-renewable sources are used |   |   |   |
| Explain patterns and trends in the use of energy resources |   |   |   |

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| **Edexcel Physics (1PI0) from 2016 Topic P4** |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 4 – Waves** | Recall that waves transfer energy and information without transferring matter |   |   |   |
| Describe evidence that with water and sound waves it is the wave and not the water or air itself that travels |   |   |   |
| Define and use the terms frequency and wavelength as applied to waves |   |   |   |
| Use the terms amplitude, period, wave velocity and wavefront as applied to waves |   |   |   |
| Describe the difference between longitudinal and transverse waves by referring to sound, electromagnetic, seismic and water waves |   |   |   |
| Recall and use both the equations for all waves: ***v = f × λ*** and ***v = x/t*** |   |   |   |
| Describe how to measure the velocity of sound in air and ripples on water surfaces |   |   |   |
| **HT ONLY: Calculate depth or distance from time and wave velocity** |   |   |   |
| Describe the effects of reflection, refraction, transmission, absorption of waves at material interfaces |   |   |   |
| Explain how waves will be refracted at a boundary in terms of the change of direction  |   |   |   |
|  **HT ONLY: Explain how waves will be refracted at a boundary in terms of the change of speed** |   |   |   |
| **HT ONLY: Recall that different substances may absorb, transmit, refract or reflect waves in ways that vary with wavelength** |   |   |   |
| **HT ONLY: Describe the processes which convert wave disturbances between sound waves and vibrations in solids** |   |   |   |
| **HT ONLY: Explain why processes that convert wave disturbances only work over a limited frequency range** |   |   |   |
| **HT ONLY: Use the process that converts wave disturbances to explain the way the human ear works** |   |   |   |
| **HT ONLY: Recall the frequency of ultrasound and state its units** |   |   |   |
| **HT ONLY: Explain uses of ultrasound and infrasound** |   |   |   |
| Describe how changes, if any, in velocity, frequency and wavelength, in the transmission of sound waves from one medium to another are inter-related |   |   |   |
| *Core Practical: Investigate the suitability of equipment to measure the speed, frequency and wavelength of a wave in a solid and a fluid* |   |   |   |