**Science Year 9– Summer Term 2022**

| | **What?**<br>**When?**<br>**Why?** | | |
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| | **BIOLOGY**<br>**B3 Genetics** | **CHEMISTRY**<br>**C3&4 Atoms & the periodic table** | **PHYSICS**<br>**P2 Forces & Motion** |
| Lesson 1 Learning intentions | **<u>Meiosis</u>**<br><br>Explain the role of meiotic cell division, including the production of four daughter cells, each with half the number of chromosomes, and that this results in the formation of genetically different haploid gametes<br>The stages of meiosis are not required.<br><br>Describe the genome as the entire DNA of an organism and a gene as a section of a DNA molecule that codes for a specific protein | **<u>Structure of the atom</u>**<br><br>Describe how the Dalton model of an atom has changed over time because of the discovery of subatomic particles.<br><br>Describe the structure of an atom as a nucleus containing protons and neutrons, surrounded by electrons in shells.<br><br>Recall the relative charge and relative mass of:<br>a) a proton<br>b) a neutron<br>c) an electron<br><br>Explain why atoms contain equal numbers of protons and electrons. | **<u>Resultant forces</u>**<br><br>Recall Newton's First Law and use it in the following situations:<br>a) where the resultant force on a body is zero, i.e. the body is moving at a constant velocity or is at rest<br>b) where the resultant force is not zero, i.e. the speed and/or direction of the body changes |

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| | | Describe the nucleus of an atom as very small compared to the overall size of the atom | |
| Lesson 2 Learning intentions | **DNA**<br><br>Describe DNA as a polymer made up of:<br>a) two strands coiled to form a double helix<br>b) strands linked by a series of complementary base pairs joined together by weak hydrogen bonds<br>c) nucleotides that consist of a sugar and phosphate group with one of the four different bases attached to the sugar.<br><br>Explain how DNA can be extracted from fruit | **Atomic and mass numbers**<br><br>Recall that most of the mass of an atom is concentrated in the nucleus.<br><br>Recall the meaning of the term mass number of an atom.<br><br>Describe atoms of a given element as having the same number of protons in the nucleus and that this number is unique to that element.<br><br>Calculate the numbers of protons, neutrons and electrons in atoms given the atomic number and mass number | **Newton's 1st law**<br><br>Recall Newton's First Law and use it in the following situations:<br>a) where the resultant force on a body is zero i.e. the body is moving at a constant velocity or is at rest<br>b) where the resultant force is not zero i.e. the speed and/or direction of the body change(s)<br><br>**Explain that an object moving in a circular orbit at constant speed has a changing velocity (qualitative only) (H)**<br><br>**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. (H)** |
| Lesson 3 Learning intentions | **Alleles**<br><br>Explain why there are differences in the inherited characteristics as a result of alleles.<br><br>Explain the terms: chromosome, gene, allele, dominant, recessive, homozygous, | **Isotopes**<br><br>Describe isotopes as different atoms of the same element containing the same number of protons but different numbers of neutrons in their nuclei. | **Mass & weight**<br><br>Define weight, recall and use the equation: weight (newton, N) = mass (kilogram, kg) × gravitational field strength (newton per kilogram, N/kg),<br><br>$W = m \times g$<br><br>Describe how weight is measured<br><br>Describe the relationship between the weight of a body and the gravitational field strength |

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| | heterozygous, genotype, phenotype, gamete and zygote.<br><br>Explain monohybrid inheritance using genetic diagrams … and family pedigrees | Calculate the numbers of protons, neutrons and electrons in atoms given the atomic number and mass number.<br><br>Explain how the existence of isotopes results in some relative atomic masses of some elements not being whole numbers.<br><br>**Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes (H)** | |
| Lesson 4 Learning intentions | **Inheritance**<br><br>Explain monohybrid inheritance using … Punnett squares.<br><br>Describe how the sex of offspring is determined at fertilisation, using genetic diagrams.<br><br>Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses and pedigree analysis for dominant and recessive traits. | **Elements and the periodic table**<br><br>Describe how Mendeleev arranged the elements, known at that time, in a periodic table by using properties of these elements and their compounds.<br><br>Describe how Mendeleev used his table to predict the existence and properties of some elements not then discovered.<br><br>Recall the formulae of elements, simple compounds and ions. | **Newton's 2nd law**<br><br>Recall and use Newton's Second Law as force (newton, N) = mass (kilogram, kg) × acceleration (metre per second squared, $m/s^2$) $F = m \times a$<br><br>**Explain that inertial mass is a measure of how difficult it is to change the velocity of an object (including from rest) and know that it is defined as the ratio of force over acceleration. (H)** |
| Lesson 5 Learning intentions | **Gene mutations** | **Atomic number & the periodic table** | **Core practical**<br><br>Core Practical: Investigate the relationship between force, mass and acceleration by varying the masses added to trolleys |

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| | State that most phenotypic features are the result of multiple genes rather than single gene inheritance.<br><br>Describe the causes of variation that influence phenotype, including a genetic variation – different characteristics as a result of mutation...<br><br>Discuss the outcomes of the Human Genome Project and its potential applications within medicine.<br><br>State that there is usually extensive genetic variation within a population of a species and that these arise through mutations.<br><br>State that most genetic mutations have no effect on the phenotype, some mutations have a small effect on the phenotype and, rarely, a single mutation will significantly affect the phenotype. | Explain that Mendeleev thought he had arranged elements in order of increasing relative atomic mass but this was not always true because of the relative abundance of isotopes of some pairs of elements in the periodic table.<br><br>Explain the meaning of atomic number of an element in terms of position in the periodic table and number of protons in the nucleus.<br><br>Describe that in the periodic table<br>a) elements are arranged in order of increasing atomic number, in rows called periods<br>b) elements with similar properties are placed in the same vertical columns called groups.<br><br>Identify elements as metals or non-metals according to their position in the periodic table, explaining this division in terms of the atomic structures of the elements | |
| Lesson 6 Learning intentions | **<u>Variation</u>**<br><br>Describe the causes of variation that influence phenotype including<br>a) genetic variation – different characteristics as a result of mutation and sexual reproduction<br>b) environmental variation – different | **<u>Electronic configuration & the periodic table</u>**<br><br>Predict the electronic configurations of the first 20 elements in the periodic table as diagrams and in the form, for example, 2.8.1. | **<u>Newton's 3rd law</u>**<br><br>Recall and apply Newton's Third Law… to equilibrium situations…<br><br>**Recall and apply Newton's Third Law… to collision interactions…(H)** |

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| | characteristics caused by an organism's environment (acquired characteristics | Explain how the electronic configuration of an element is related to its position in the periodic table | |
| Lesson 7 Learning intentions | | | **<u>Momentum (higher tier only)</u>**<br><br>**Recall and apply Newton's Third Law… to collision interactions and relate it to the conservation of momentum in collisions.**<br><br>**Define momentum, recall and use the equation: momentum (kilogram metre per second, kg m/s) = mass (kilogram, kg) × velocity (metre per second, m/s) $p = m \times v$**<br><br>**Describe examples of momentum in collisions**<br><br>**Use Newton's Second Law as: force (newton, N) = change in momentum (kilogram metre per second, kg m/s) ÷ time (second, s)**<br><br>**$F = (mv - mu)/t$** |
| Lesson 8 Learning intentions | | | **<u>Stopping distances</u>**<br><br>Explain methods of measuring human reaction times and recall typical results.<br><br>Recall that the stopping distance of a vehicle is made up of the sum of the thinking distance and the braking distance<br><br>Explain that the stopping distance of a vehicle is affected by a range of factors including:<br>a) the mass of the vehicle<br>b) the speed of the vehicle<br>c) the driver's reaction time<br>d) the state of the vehicle's brakes<br>e) the state of the road |

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| | | | f) the amount of friction between the tyre and the road surface.<br><br>Describe the factors affecting a driver's reaction time including drugs and distractions |
| Lesson 9 Learning intentions | | | **<u>Crash hazards</u>**<br><br>Explain the dangers caused by large decelerations **and estimate the forces involved in typical situations on a public road (H)**<br><br>**Use Newton's Second Law as: force (newton, N) = change in momentum (kilogram metre per second, kg m/s) ÷ time (second, s)**<br>$F = (mv - mu)/t$ **(H)** |
| Lesson 10 Learning intentions | | | |