

Rationale

Year 10 pupils will continue with the Entry Level Certificate until they have completed it mid-way through the year. The programme covers the skills outlined in the National Curriculum. It builds up foundational knowledge and concepts. Pupils will be encouraged to understand how science can be used to explain what is occurring, make predictions and analyse causes.

When pupils have completed the Entry Level Certificate, they will start the GCSE Biology (single award) course.

Literacy skills will be developed in science by encouraging pupils to use and understand scientific vocabulary in spoken and written work, reading and interpreting prose and data and writing reasoned conclusions. Pupils will be taught how to read, write, speak and think like a scientist.

Curriculum Intention at KS4 – Science.

National Curriculum details	
Biology	Cell biology - Cells as the basic structural unit of all organisms; adaptations of cells related to their functions; the main sub-cellular structures of eukaryotic and prokaryotic cells - Stem cells in animals and meristems in plants - Enzymes - Factors affecting the rate of enzymatic reactions - The importance of cellular respiration; the processes of aerobic and anaerobic respiration - Carbohydrates, proteins, nucleic acids and lipids as key biological molecules. Transport systems - The need for transport systems in multicellular organisms, including plants - The relationship between the structure and functions of the human circulatory system. Health, disease and the development of medicines - The relationship between health and disease - Communicable diseases including sexually transmitted infections in humans (including HIV/AIDs) - Non-communicable diseases - Bacteria, viruses and fungi as pathogens in animals and plants - Body defences against pathogens and the role of the immune system against disease - Reducing and preventing the spread of infectious diseases in animals and plants - The process of discovery and development of new medicines - The impact of lifestyle factors on the incidence of non-communicable diseases. Coordination and control - Principles of nervous coordination and control in humans - The relationship between the structure and function of the human nervous system - The relationship between structure and function in a reflex arc - Principles of hormonal coordination and control in humans - Hormones in human reproduction, hormonal and non-hormonal methods of contraception - Homeostasis. Photosynthesis - Photosynthesis as the key process for food production and therefore biomass for life - The process of photosynthesis - Factors affecting the rate of photosynthesis. Ecosystems - Levels of organisation within an ecosystem - Some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community - How materials cycle through abiotic and biotic components of ecosystems - The role of microorganisms (decomposers) in the cycling of materials through an ecosystem - Organisms are interdependent and are adapted to their environment - The importance of biodiversity - Methods of identifying species and measuring distribution, frequency and abundance of species within a habitat - Positive and negative human interactions with ecosystems. Evolution, inheritance and variation - The genome as the entire genetic material of an organism - How the genome, and its interaction with the environment, influence the development of the phenotype of an organism - The potential impact of genomics on medicine - Most phenotypic features being the result of multiple, rather than single, genes - Single gene inheritance and single gene crosses with dominant and recessive phenotypes - Sex determination in humans - Genetic variation in populations of a species - The process of natural selection leading to evolution - The evidence for evolution - Developments in biology affecting classification - The importance of selective breeding of plants and animals in agriculture - The uses of modern biotechnology including gene technology; some of the practical and ethical considerations of modern biotechnology.
Chemistry	Chemical changes - Determination of empirical formulae from the ratio of atoms of different kinds - Balanced chemical equations, ionic equations and state symbols - Identification of common gases - The chemistry of acids; reactions with some metals and carbonates - PH as a measure of hydrogen ion concentration and its numerical scale - Electrolysis of molten ionic liquids and aqueous ionic solutions - Reduction and oxidation in terms of loss or gain of oxygen. Atomic structure and the Periodic Table - A simple model of the atom consisting of the nucleus and electrons, relative atomic mass, electronic charge and isotopes - The number of particles in a given mass of a substance - The modern Periodic Table, showing elements arranged in order of atomic number - Position of elements in the Periodic Table in relation to their atomic structure and arrangement of outer electrons - Properties and trends in properties of elements in the same group - Characteristic properties of metals and non-metals - Chemical reactivity of elements in relation to their position in the Periodic Table. Chemical analysis - Distinguishing between pure and impure substances - Separation techniques for mixtures of substances: filtration, crystallisation, chromatography, simple and fractional distillation - Quantitative interpretation of balanced equations - Concentrations of solutions in relation to mass of solute and volume of solvent.
Physics	Forces and motion Speed of sound, estimating speeds and accelerations in everyday contexts

	• Interpreting quantitatively graphs of distance, time, and speed • Acceleration caused by forces; Newton's First Law • Weight and gravitational field strength • Decelerations and braking distances involved on roads, safety Energy • Energy changes in a system involving heating, doing work using forces, or doing work using an electric current: calculating the stored energies and energy changes involved • Power as the rate of transfer of energy • Conservation of energy in a closed system, dissipation • Calculating energy efficiency for any energy transfers • Renewable and non-renewable energy sources used on Earth, changes in how these are used. Electricity • Measuring resistance using p.d. and current measurements • Exploring current, resistance and voltage relationships for different circuit elements; including their graphical representations • Quantity of charge flowing as the product of current and time • Drawing circuit diagrams; exploring equivalent resistance for resistors in series • The domestic a.c. supply; live, neutral and earth mains wires, safety measures • Power transfer related to p.d. and current, or current and resistance.
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Long term planning grid

Year	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
10	Acids and Alkalis C2 Everything in its place C3	Fuels C9 Driving along P10	Alternative energy P5 Electricity supply P7	You are your genes B1	B2 – Keeping healthy	B3 – Living together
11	B4 - Using food and controlling growth	B5 - The human body – staying alive	B6 - Life on Earth – past, present and future	Exam revision		

*The Entry Level Certificate biology units (Units B5, B6, B8, B12) will be incorporated through the GCSE Biology course.

Qualifications on offer:

OCR Entry Level Certificate – Science

OCR GCSE Biology (single award)

Curriculum Sequencing

Yr 10	Knowledge focus	Assessment focus	Keywords	Personal Development Links
Term	Acids and Alkalis C2 Everything in its place C3			
Year 10 Autumn Term 1	Acids and Alkalis C2 - Know how to handle acids and alkalis safely. - Understand neutralisation and its uses. - Suggested practical skills: C1, C3, U1, U2, U3, U4 Everything in its place C3 - Understand atoms and how the atomic model has developed over time. - Understand the periodic table and the properties for group 0, 1 and 7. - Know isotopes and be able to calculate the number of protons, neutrons and electrons in an atom - Suggested practical skills: U1.	Describe how to handle acids and alkalis safely. Explain neutralisation and its uses. Describe how the atomic model has developed over time. Explain what isotopes are. Calculate the number of protons, neutrons and electrons in an atom.	Acids and Alkalis C2 indicator PH neutral indigestion Everything in its place C3 proton neutron electron element	Acids and Alkalis C2 Personal development – Developing safe working practices and risk awareness. Career link – Hairdresser/Beauty Therapist/ Laboratory Technician/ Environmental Health Officer Cross curricular – Mathematics/ Design and Technology Everything in its place C3 Personal development – Understanding how scientific knowledge develops over time. Developing analytical and evidence-based thinking. Career link – Chemist/ Materials Scientist/ Pharmacist/ Laboratory Scientist Cross curricular – Mathematics/ Computing
	Fuels C9 Driving along P10			
Year 10 Autumn Term 2	Fuels C9 - Know about crude oil and our reliance on hydrocarbons in the modern world. - Understand how crude oil is separated by fractional distillation and be able to recall uses for the different fractions. - Understand that plastics are made from polymers which are long chains of monomers joined together. - Suggested practical skills: C1, C3, U1, U2, U3, U4 Driving along P10 - Understand that speed is a measure of distance/time and how to interpret a distance/time graph. - Know speed limits, stopping distances and things that can help prevent or protect us in a car accident. - Suggested practical skills: P1, P2, P3, U1, U4	Describe how we are reliant on hydrocarbons. Explain how crude oil is separated. Interpret distance/time graphs.	Fuels C9 crude oil petrol diesel fuel burning Driving along P10 speed stopping distance	Fuels C9 Personal development – Environmental awareness and sustainability. Understanding personal energy consumption. Making responsible choices regarding resources. Career link – Chemical Engineer/ Energy Technician/ Environmental Scientist/ Petrochemical Industry Worker/ Sustainability Officer Cross curricular – Geography Driving along P10 Personal development – Road safety awareness. Understanding risk and personal responsibility. Decision-making and hazard perception. Career link – Transport Planner/ Automotive Engineer/ Vehicle Technician/ Police Roads Unit Cross curricular – Mathematics
	Alternative energy P5 Electricity supply P7			
Year 10 Spring Term 1	Alternative energy P5 - Know about energy resources including both renewable and non-renewable sources. - Understand how electricity is generated and how important sustainable energy resources are for our futures. - Suggested practical skills: P1, P2, P3, U1, U3, U4 Electricity supply P7 - Understand electricity including series and parallel circuits and the components involved in circuits. - Know conducting and insulating components. - Understand energy efficiency and ways to reduce energy loss from the home. - Suggested practical skills: P3, P4, U1, U3, U4	Describe energy resources. Explain how electricity is generated. Identify components of a circuit. Describe series and parallel circuits. Explain ways to reduce energy loss from the home.	Alternative energy P5 energy source renewable non-renewable fuel tidal power wind turbine solar cell Electricity supply P7 battery fossil fuel power station power grid Unit	Alternative energy P5 Personal development – Environmental stewardship. Awareness of climate change and sustainable living. Evaluating future energy challenges. Career link – Renewable Energy Engineer/ Wind Turbine Technician/ Solar Installation Engineer/ Environmental Consultant/ Sustainability Manager Cross curricular – Geography Electricity supply P7 Personal development – Energy efficiency awareness. Household budgeting and reducing energy costs. Safe use of electrical equipment. Career link – Electrician/ Electrical Engineer/ Building Services Engineer/ Smart Technology Installer/ Power Network Technician Cross curricular – Design and Technology

	B1 - You are your genes			
Year 10 Spring Term 2	B1 - You are your genes - Know about the genome and what it does. - Understand how genetic information is inherited. - Know how gene technology can and should be used.	Describe what a genome is and what it does. Explain how genetic information is inherited.	B1 - You are your genes genome nucleus DNA gene allele variation dominant recessive carrier genetic testing	B1 - You are your genes Personal development – Understanding individuality and diversity. Developing self-awareness and identity. Exploring ethical issues surrounding genetics. Respecting differences among individuals. Career link – Genetic Counsellor/ Biomedical Scientist/ Doctor Forensic Scientist/ Genetic Researcher Cross curricular – Mathematics
	B2 – Keeping healthy			
Year 10 Summer Term 1	B2 – Keeping healthy - Know what causes disease. - Understand how organisms protect themselves against pathogens and how can we prevent infections from spreading? - Know that lifestyle, genes and the environment affect health and how we treat disease.	Describe what causes disease. Explain how organisms protect themselves.	B2 – Keeping healthy symptom pathogen incubation period immune system antibodies immunity contamination vaccine herd immunity coronary heart disease correlation anti-biotic resistance clinical testing Placebo	B2 – Keeping healthy Personal development – Understanding the importance of healthy lifestyle choices. Developing awareness of physical and mental wellbeing. Understanding personal responsibility for preventing the spread of infection. Career link – Doctor/ Nurse/ Paramedic/ Pharmacist/Nutritionist Cross curricular – RSHE
	B3 – Living together			
Year 10 Summer Term 2	B3 – Living together - Know about photosynthesis and how producers get the substances they need. - Know about organisms in an ecosystem and how they are interdependent. - Understand how populations are affected by conditions in an ecosystem.	Describe what photosynthesis is. Explain how populations are affected by conditions in an ecosystem.	B3 – Living together photosynthesis chloroplast enzyme catalyst diffusion osmosis active transport community ecosystem food chain interdependence carbon cycle bioaccumulation representative sample indicator species	B3 – Living together Personal development – Developing environmental responsibility and sustainability awareness. Understanding the impact of human activity on ecosystems. Appreciating the importance of biodiversity and conservation. Career link – Ecologist/ Conservation Officer/ Environmental Scientist/ Marine Biologist/ Forestry Worker/ Wildlife Ranger/ Horticulturalist/ Park Ranger Cross curricular – Geography

Yr 11	Knowledge focus	Assessment focus	Keywords	Personal Development Links
Term	B4 - Using food and controlling growth			
Year 11 Autumn Term 1	B4 - Using food and controlling growth - Know cellular respiration and the functions of mitochondria and other cell structures. - Understand how organisms grow and develop and how we use stem cells to treat damage and disease.	Describe cellular respiration. Explain how organisms grow and develop. Explain how stem cells are used to treat damage and disease.	B4 - Using food and controlling growth cellular respiration mitochondria exothermic fermentation magnification resolution mitosis meiosis sexual reproduction unspecialised embryonic stem cells stem cell treatment hazard	B4 - Using food and controlling growth Personal development – Understanding how the body grows and develops. Developing awareness of medical advances and their impact on society. Career link – Biotechnologist/ Physiotherapist/ Stem Cell Researcher/ Biomedical Scientist Cross curricular – RSHE/ Mathematics
	B5 - The human body – staying alive			
Year 11 Autumn Term 2	B5 - The human body – staying alive - Know how substances get into, out of and around our bodies. - Understand how the nervous system helps us respond to changes. - Understand how hormones control responses in the human body and the role they play in human body. - Understand why we need to maintain a constant internal environment and what can happen if our organs or control systems stop working.	Explain how the nervous system works. Explain the role of hormones. Explain what happens if our organs stop working.	B5 - The human body – staying alive circulatory system digestive system excretory system deoxygenated blood oxygenated blood red blood cell stimulus effector neuron synapse reflex hormone homeostasis menstrual cycle contraceptive pill	B5 - The human body – staying alive Personal development – Understanding how lifestyle affects body systems and overall health. Encouraging healthy choices that support long-term wellbeing. Career link – Physiologist/ Sports Scientist/ Occupational Therapist Cross curricular – RSHE/ Mathematics
	B6 - Life on Earth – past, present and future			
Year 11 Spring Term 1	B6 - Life on Earth – past, present and future - Know about the theory of evolution. - Understand how DNA helped us to classify organisms. - Know how biodiversity is threatened and how we can protect it.	Describe the theory of evolution. Explain how DNA helps us to classify organisms. Describe how we can protect biodiversity.	B6 - Life on Earth – past, present and future evolution natural selection variation extinction selective breeding fossil record classification species biodiversity sustainability biodegradable	B6 - Life on Earth – past, present and future Personal development – Appreciating biodiversity and the value of conservation. Understanding humanity's role in protecting the environment. Career link – Conservation Scientist/ Ecologist/ Environmental Consultant Cross curricular – Geography
	Exam revision			
Year 11 Spring Term 2				
	Exam season			
Year 11 Summer Term 1				
	Exam season			
Year 11 Summer Term 2				

Year 8-10 Practical Skills	
Universal science skill areas (U)	
U1	Use of appropriate apparatus to make and record a range of measurements accurately.
U2	Safe use of appropriate heating devices and techniques.
U3	Obtaining and recording the results of a practical activity in an appropriate format.
U4	Follow a plan.
Biology skill areas (B)	
B1	Use of appropriate apparatus to observe and measure a biological change or process.
B2	Measure the rate of a reaction in biology.
B3	Use appropriate sampling techniques to investigate the distribution and abundance of organisms in an ecosystem via direct use in the field.
B4	Use of appropriate apparatus, and techniques to magnify a biological sample.
Chemistry skill areas (C)	
C1	Use of appropriate apparatus to conduct and monitor chemical reactions.
C2	Safe use of a range of equipment to purify and/ or separate chemical mixtures.
C3	Safe and careful handling of gasses, liquids and solids.
C4	Use of appropriate apparatus and techniques carry out electrolysis.
Physics skill areas (P)	
P1	Use of appropriate apparatus and techniques to measure and observe the effects of forces on the extension of springs.
P2	Use of appropriate apparatus and techniques for measuring motion.
P3	Safe use of appropriate apparatus to measure energy changes/transfers including work done.
P4	Use of appropriate apparatus to measure current, potential difference and resistance. Some of these skill areas are sub-divided into individual skills. Learners can be given half a point.