YEAR 10 HALF TERM 1 SCIENCE LEARNING PROGRAMME

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Infection and response	Define the term pathogen and state the four main groups of pathogen, giving examples and how they can spread and how this can be prevented. Describe how microorganisms can be safely grown on agar plates in optimum conditions and recognise bacterial and fungal colonies growing on agar plates.. Describe the life cycle of the malarial protist. Describe the symptoms, mode of transmission, prevention and treatment for malaria. Explain first line of defence and how the immune system defends against disease. Describe and explain ways in which the body can respond to a pathogen. Describe the main steps in the development and testing of a new drug. Explain the terms placebo and double-blind trial. Explain the need for drug testing Describe what MABs are, and how they are produced/work/not yet widely used. Evaluate MABs (TRIPLE ONLY)	Antibiotic Bacteria Clinical trial Double-blind trial Efficacy Epidemic Fungi Hybridoma Monoclonal antibodies Phagocytosis Placebo (in drug testing) Toxicity Vector (in genetic engineering) Virus Vaccinations	Pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. Since the 1940s a range of antibiotics have been developed which have proved successful against a number of lethal diseases caused by bacteria. Unfortunately many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics.	This GCSE topic builds upon a foundation provided in Year 7 during the Cells topic. It also builds upon knowledge pupils have developed during the GCSE curriculum, in the topic of Cells in Year 9.	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 10 HALF TERM 2 SCIENCE LEARNING PROGRAMME

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Electricity	Draw and interpret circuit symbols Charge flow = current x time and rearrange the equation. Describe the relationship between current, resistance and potential difference PD = current x resistance Be able to rearrange the equation and state the units for each Investigate the factors affecting the resistance of electrical circuits (length of wire and resistors in series/parallel) Explain how current behaves through an ohmic conductor and draw a Current/PD graph Explain the relationship between Current at PD in a filament lamp, diode and resistors and draw current/PD graphs Explain the application of LDR's in circuits Construct appropriate circuits to investigate the I-V characteristics of a variety of circuit elements e.g. filament lamp, diode and resistor	Alternating current (ac) Ammeter Current Diode Direct current (dc) Electric field Light dependent resistor (LDR) Mains electricity National Grid Ohmic conductor Parallel circuit Potential difference Resistance Series circuit Static electricity Step - down transformer Step - up transformer Thermistor Voltmeter Wires in 3 - core cable	Electric charge is a fundamental property of matter everywhere. Understanding the difference in the microstructure of conductors, semiconductors and insulators makes it possible to design components and build electric circuits Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. Electrical power fills the modern world with artificial light and sound, information and entertainment, remote sensing and control. The fundamentals of electromagnetism were worked out by scientists of the 19th century. However, power stations, like all machines, have a limited lifetime. If we all continue to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future?	This GCSE topic builds upon a foundation provided in Year 8 Electricity topic.	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 10 HALF TERM 2 SCIENCE LEARNING PROGRAMME

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Electricity	Compare Series and Parallel circuits Describe mains electricity and describe the difference between AC and DC current Be able to wire a plug Explain the role of the live, neutral and earth wire in a plug Calculate power Describe how domestic appliances transfer energy Calculate energy transfer Explain how the power of a device is related to the PD and current and energy transfer Describe relationship between power ratings for domestic electrical appliances and changes in energy store Explain the National Grid system **Static (PHYSICS ONLY)** Describe production of static Explain the transfer of electrons in static electricity Draw Electric fields and explain the concept of Electric Fields				

YEAR 10 HALF TERM 2 SCIENCE LEARNING PROGRAMME

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Organisation	To describe the organisation of organisms including cells, tissues, organs and organ systems. To describe how the organs of the digestive system work together to digest & absorb food. **RP: To** use qualitative reagents to test for carbohydrates, lipids proteins **RP: To** investigate the effect of pH on the rate of reaction of amylase enzyme. To describe the form, function and adaptations of the human circulatory system, including the heart, blood vessels and blood. To evaluate the various methods of treating cardiovascular disease. To interpret data on the effect of lifestyle on some non-communicable diseases. To explain how the xylem, phloem, root hair cells are adapted for their function. To describe how light intensity, temperature, air flow and humidity affect the rate of transpiration	Vein Capillary Haemoglobin Atrium Ventricle, Red blood cells Haemoglobin White blood cells Platelets Plasma Phloem, Xylem, Transpiration, Translocation, Stomata,	In this section, we will learn about the human digestive system, which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case, they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. The plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis. .	This topic builds upon principles introduced during the Year 7 topics; Body systems, plants and the year 8 Fitness and health topic. It also builds upon knowledge pupils have developed during the GCSE curriculum, in the Cells and Infection & response topics covered in Year 9.	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 10 HALF TERM 3 SCIENCE LEARNING PROGRAMME

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Energy	Describe energy changes in different systems for common situations. Calculate energy changes when a system is changed by heating, work done by forces and work done by a current flowing. Recall and apply the following equations: $E_k=1/2mv^2$, $E_p=mgh$, P=E/t, P=W/t Calculate the efficiency of an appliance & explain conservation of energy. Describe and calculate the specific heat capacity of a substance. define the term 'work done' and be able to calculate the amount of energy transferred. Calculate Power. Explain how each insulation reduces energy loss and what type of energy transfer it reduces. Explain all stages including role of transformers in the National Grid. Compare the ways that different energy resources are used.	System Energy stores Conservation of energy Dissipated Efficiency Elastic potential energy Global warming Gravitational field strength (g) Gravitational potential energy Joules, J Kinetic energy Mass Renewable Non- renewable Power Specific heat capacity Thermal conductivity Watts, W Weight Work done	The concept of energy emerged in the 19th century. The idea was used to explain the work output of steam engines and then generalised to understand other heat engines. It also became a key tool for understanding chemical reactions and biological systems. Limits to the use of fossil fuels and global warming are critical problems for this century. Physicists and engineers are working hard to identify ways to reduce our energy usage. .	Links to the KS3 Energy unit in year 8. Concepts learnt in this unit are used in the KS4 forces unit.	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 10 HALF TERM 4 SCIENCE LEARNING PROGRAMME

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Forces	To illustrate the interactions between objects in free body diagrams (incl. scale diagrams) Explain the difference between scalars and vectors Describe and calculate the effect of gravity on mass and weight Describe the relationship between energy and work done Describe the effect of forces on elastic objects , (incl. Hooke's Law required practical) Describe the concept of stopping distance and evaluate the factors that affect thinking and braking distance Describe the concept of momentum during events and its relationship with force during impacts Calculate resultant forces and apply understanding of overall forces to Newton's 1st and 2nd laws. Apply Newton's 3rd law in equilibrium situations Describe the motion of objects **(Physics only)** To describe the effects of turning forces **(Physics only)** To describe and calculate pressure and pressure differences in fluids (incl. upthrust)	Scalar Vector Contact Non-contact Gravity Resultant Work done Elastic Inelastic Distance Displacement Speed Velocity Acceleration Stopping distance Reaction time	Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible.	This topic builds on the KS3 topics of: Particles (pressure in liquids and gases) Magnetism (forces and fields) Electricity (forces and fields) Space (gravity and weight, satellites and orbits) Forces in action (what are forces, resultant forces, free body diagrams, Newton's Laws, friction and drag, elasticity and Hooke's Law, speed, motion graphs, work done, moments and levers, stopping distances) Energy (work done) This topic has links to other KS4 topics including: Electricity (non-contact forces) Magnetism and Electromagnetism (non-contact forces) Space Physics (non-contact forces, gravity, circular motion) Particle Model (pressure in fluids, density, weight and upthrust) Energy (elastic potential energy and work done, mechanical work and braking) Homeostasis and Response (reaction time and required practical)	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 10 HALF TERM 4 SCIENCE LEARNING PROGRAMME

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Atomic structure	Describe the structure of an atom Describe the differences between isotopes Describe the differences between the plum pudding and nuclear models Describe the process of radioactive decay Describe the types, properties and uses of nuclear radiation To represent radioactive decay in nuclear equations Explain the concept of half-life and calculate the half-life or net decline of an isotope Compare the hazards of and precautions for irradiation and contamination (Physics only) Describe the concepts of background radiation and radiation dose Describe and evaluate the uses and risks of nuclear radiations in medicine Describe and illustrate the processes of nuclear fission and fusion	Nucleus Proton Neutron Electron Isotope Plum Pudding Nuclear Model Radioactive decay Radiation Alpha Beta Gamma Half-life Irradiation Contamination	Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. Early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently improved. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation.	This topic builds on the KS3 topics of: Periodic Table (atoms and elements) Bonding and Structure (structure of the atom) Electricity (fission and generating electricity) Space (fusion and star life cycles) This topic is linked to the KS4 topics of: Atomic Structure & Periodic Table (structure of an atom, mass number, atomic number and isotopes, development of models of the atom Waves (electromagnetic radiation electron levels and gamma radiation) Space Physics (fusion and stellar evolution) Energy and Electricity (fission, energy transfers and electricity generation) Organisation (radiation and cancer risk, ionising radiation and uncontrolled growth and division) Infection and Response (radioactive decay and monoclonal antibodies)	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Inheritance and Variation	To describe sexual reproduction and asexual reproduction in animals and plants and explain the advantages and disadvantages of both. Describe the structure of DNA and define Genome. Describe the structure of DNA in detail, including a description of protein synthesis and explain how a mutation could affect the formation of a protein (Biology only) Interpret a genetic cross diagram and use direct proportion and simple ratios to express the outcomes. Describe Darwin's theory of evolution by natural selection and explain how fossils provide evidence for evolution. Explain the impact of selective breeding of food, plants and domesticated animals. Describe the methods of cloning and explain the risks & benefits of each and the ethical objections (Biology only). To understand how organisms are classified and interpret evolutionary trees.	Chromosome Gene DNA Allele Dominant Recessive Natural selection Gamete Genetic engineering Genome Genotype Phenotype Heterozygous Homozygous Clone	In this section, we will discover how the number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the individual. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced, it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Scientists have now discovered how to take genes from one species and introduce them in to the genome of another by a process called genetic engineering.	This topic builds upon principles introduced in the Year 7 topics Cells and Body systems. Also, the Year 8 topic, Inheritance. It also builds upon knowledge pupils have developed during the GCSE curriculum on the topic Cells and Infection & response covered during terms 1 and 6 of year 9.	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Quantitative	Understand the principles behind the conservation of mass. Calculate relative formula mass. Understand that reactions may appear to have a change in mass due to loss or gain of a gaseous substance. Understand uncertainty in results obtained. (H) Understand the concept of the mole. (H) Calculate amounts of substance. (H)To use moles to balance equations. (Triple Only) Calculate concentration using mass and using moles. Understand the concept of percentage yield and carry out calculations. Understand the concept of atom economy and carry out calculations. Use amounts of substances to calculate volumes of gases.	Conservation of mass Relative formula mass (M_r) Uncertainty Product Reactant Mole Avogadro Constant Concentration Volume	Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions. Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a key way for chemists to communicate chemical ideas.	Links to KS3 Bonding topic Links to Chemical Changes in KS4	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 10 HALF TERM 6 SCIENCE LEARNING PROGRAMME

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Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Ecology	To describe how energy is passed through an ecosystem. To describe how materials are recycled by the living world. To describe how organisms are adapted to their environments. To explain ow species living in an ecosystem depend on each other and how they are affected by abiotic and biotic factors. To explain how these ecosystems support human life and continued development. To evaluate the relationship between humans and ecosystems. To evaluate the sustainability of biodiversity.	Abiotic and biotic Community Ecosystem Interdependence Adaptations Abundance Biodiversity Sustainability	The Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development. In order to continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section, we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity and well-being.	This GCSE topic builds upon a foundation provided in Year 7 during the Plants topic and Year 8 Living together topic. It also builds upon knowledge pupils have developed during the GCSE curriculum, in the topic of Cells in Year 9.	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.