YEAR 11 HALF TERM 1 SCIENCE LEARNING PROGRAMME

Love God
Serve others
Work hard
Value all

Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Chemical analysis	To understand the concept of a pure substance and how they can be distinguished. To be able to explain and identify formulations. To explain chromatography and calculate R_f values. To know the tests for hydrogen, oxygen, carbon dioxide and chlorine. Identification of ions by chemical and spectroscopic means. (Chemistry only) To identify metal ions from flame tests. To use sodium hydroxide solution to identify metal ions. To use tests to identify carbonate, halide and sulfate ion. To understand the advantages of instrumental methods. To understand the principles behind flame emission spectroscopy.	**Tier 2** **Pure** **Tier 3** **Purity** **Formula** **Formulation** **Cation** **Anion** **Precipitate** **Spectroscope**	Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work.	This GCSE topic builds upon a foundation provided in Year 7 during the Science Skills topic. It also builds upon knowledge pupils have developed during the GCSE curriculum, in the topic of	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 11 HALF TERM 2 SCIENCE LEARNING PROGRAMME

Love God
Serve others
Work hard
Value all

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)	**Tier 2** **Contact** **Non-contact** **Speed** **Distance** **Tier 3** **Scalar** **Vector** **Gravity** **Resultant** **Work done** **Elastic** **Inelastic** **Displacement** **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 11 HALF TERM 2 SCIENCE LEARNING PROGRAMME

Love God
Serve others
Work hard
Value all

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	**Tier 3** **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.	Academic Text: https://kids.britannica.com/students/article/Chernobyl-disaster/319434 Understanding how Nuclear radiation can lead to disaster. 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.

Love God
Serve others
Work hard
Value all

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.	**Tier 3** **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.	Academic Text: https://www.sciencejournalforkids.org/articles/how-can-we-use-genetic-engineering-to-get-rid-of-malaria-for-good/ 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.

YEAR 11 HALF TERM 3 SCIENCE LEARNING PROGRAMME

Love God
Serve others
Work hard
Value all

Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Magnetism and electromagnetism.	To describe the difference between permanent and induced magnets To describe the attraction and repulsion between unlike and like poles for permanent magnets To describe, draw and explain the concepts of magnetic fields. To explain how the strength of an electromagnet can be increased. To explain the motor effect using Flemming's left-hand rule. (HT) To be able to calculate force, magnetic flux density, current and length. (HT) Explain the principles of an electric motor (HT) Physics only: To explain how loudspeakers and headphones use the motor effect To understand and explain the generator effect and its uses. To explain the principles of a transformers and carry out appropriate calculations.	**Tier 2** **Poles** **Attract** **Repel** **Motor** **Tier 3** **Magnet** **Permanent magnet** **Induced magnet** **Magnetic field** **Electromagnetism** **Solenoid** **Magnetic flux density** **Generator** **Alternator, Dynamo** **A.C.** **D.C.** **Step up transformer** **Step down transformer**	Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this.	This topic builds upon principles introduced in the Year 7 topic of Magnetism. And the year 8 topic on Electricity. It also builds upon knowledge pupils have developed during the GCSE curriculum in the topics Electricity and Forces covered in year 10.	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 11 HALF TERM 4 SCIENCE LEARNING PROGRAMME

Love God
Serve others
Work hard
Value all

Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Waves	Describe the difference between longitudinal and transverse waves Describe the main properties of wave motion Recall and apply the wave speed equation (incl. required practical) Describe examples of the uses and dangers of EM waves Describe and illustrate how different substances may absorb, transmit, refract or reflect electromagnetic waves (Physics only) Describe the propagation of sound waves and its link with human hearing range Describe the use of waves for detection/exploration Compare convex and concave lenses in ray diagrams Explain the effects of filters and the colour of objects Describe the emission and absorption of infrared radiation, and applied to the Earth's temperature Describe the relationship between temperature and emitted radiation	**Tier 2** **Frequency** **Period** **Speed** **Energy** **Absorb** **Reflect** **Tier 3** **Transverse** **Longitudinal** **Amplitude** **Wavelength** **Electromagnetic** **Emit** **Refract** **Radiation dose**	Wave behaviour is common in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves.	This topic builds on the KS3 topics of: Earth Chemistry (global warming) and Waves (types of wave, wave features, light waves, the eye and seeing, light waves meeting objects, colours, reflection, refraction, lenses and eyesight defects, sound waves, the ear and hearing, ultrasound, wave equations, measuring waves, EM spectrum, IR radiation) This topic has links to the KS4 topics of: Homeostasis and Response (light waves, spectacles, lenses and the eye) Organisation (UV, X-rays, gamma radiation and cancer risk factors) Atomic Structure (gamma radiation) Infection and Response (radiotherapy and monoclonal antibodies) Chemistry of the Atmosphere (greenhouse gases, climate change and temperature of the Earth) Ecology (global warming and temperature of the Earth)	This will be set as either a Vocabulary test or as consolidation questions on a weekly basis.

YEAR 11 HALF TERM 4 SCIENCE LEARNING PROGRAMME

Love God
Serve others
Work hard
Value all

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.	**Tier 3** **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.	Academic Text: https://www.sciencejournalforkids.org/articles/what-happens-to-sea-lampreys-if-catfish-move-in/ 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.

YEAR 11 HALF TERM 4 SCIENCE LEARNING PROGRAMME

Love God
Serve others
Work hard
Value all

Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Revision	To improve upon areas of weakness	Vocabulary will vary dependent upon identified by class teacher	Improve upon areas of weakness identified for the class.	Linked learning will vary dependent upon identified by class teacher	Homework will be tailored towards the weaknesses of the students in the class to further aid progress.

Love God
Serve others
Work hard
Value all

Topic	Learning Objectives	Key Vocabulary	Learning Sequence	Linked Learning	Home Learning
Revision	To improve upon areas of weakness	Vocabulary will vary dependent upon identified by class teacher	Improve upon areas of weakness identified for the class.	Linked learning will vary dependent upon identified by class teacher	Homework will be tailored towards the weaknesses of the students in the class to further aid progress.