Science Department Programme of Study: Combined Science PHYSICS

	Year 7	Year 8	Year 9	Year 10	Year 11
Phase 1	**PRACTICAL SKILLS** This unit introduces students to the practical nature of Science. It provides the fundamental practical skills that students will require and build upon over at least the next 5 years. **7I – ENERGY & 8K FORCES** This unit looks at food, energy stores and transfers, and energy resources. Introduction to forces. **7F – Acids and alkalis** This unit looks at acids and alkalis and how they are described using a pH number. It looks at neutralisation reactions and some of their uses, and reinforces standard hazard symbols.	**7H – ATOMS, ELEMENTS AND COMPOUNDS** This unit expands on particle theory and explains the difference between atoms, and molecules, elements and compounds, whilst linking these with the more abstract ideas of particle models, naming compounds and word equations. **8E – COMBUSTION** What are combustion and oxidation reactions, including those of hydrocarbons, metals and non-metals? The idea of an exothermic reaction is introduced and there is also a look at the pollution of the air by the products of fossil fuel combustion. There are opportunities to discuss the impact of global warming and methods for controlling carbon dioxide.	**CONSERVATION OF ENERGY** How energy is stored and transferred How to represent energy transfer diagrams How to calculate efficiency How to reduce transfers of wasted energy How to calculate the amount of GPE or KE stored in objects Evaluate the different renewable and non-renewable resources we use to make electricity for heating, cooking and for transport	**EM SPECTRUM** Refraction core practical **ENERGY - FORCES DOING WORK** The effects of balanced and unbalanced forces How the energy in a system can be changed How to calculate the power and work done How objects interact with each other, through force fields and contact forces How to use vector diagrams to work out the effects of forces on an object	**PARTICLE MODEL 2** How changing the temperature of a gas affects its pressure and how to calculate temperatures and pressures **EM INDUCTION** How to use the power equation for transformers How transformers are used in the national grid How a current is induced in a wire and the factors which affect it How a transformer works
Phase 2	**7E – MIXTURES & SEPARATIONS** This unit revises and builds on work in KS2 on materials, specifically on mixtures, solutions and separation techniques using the context of providing clean drinking water. This consolidates the practical skills acquired in Phase 1. **7A – CELLS, TISSUES, ORGANS & SYSTEMS** This unit starts by reminding students about the features of organisms MRSGREN, and then looks at organ systems, organs, tissues and cells. This includes looking at how microscopes have changed and the discoveries it has led to.	**8K – ENERGY TRANSFERS** This unit looks at energy transfers by heating in the context of homes. **7L – SOUND** This unit looks at how sounds are made, transmitted and detected, some uses of sound and compares sound wave with waves on the surface of water. **8J – LIGHT** This unit revises work from KS2 on light, which is then extended to consider how light travels and what happens when it meets an object. The unit is set in the context of stage, film and illusions. **9A – GENETICS & EVOLUTIONS** This unit recaps ideas about the causes of variation and then looks at inherited variation in more detail. DNA is introduced before students consider how inherited genes can affect an organism's survival. The unit ends with coverage of natural selection.	**PARTICLE MODEL 1** The properties of solids, liquids and gases. How particles and arranged in solids, liquids and gases How to explain different densities of substances and how to calculate density How to measure the specific heat capacity and the Latent heat of a substance	**MOTION** The difference between vector and scalar quantities How to calculate speed and acceleration To represent journeys on distance/time and velocity/time graphs How to use graphs to calculate speed, acceleration and distance travelled **MOTION AND FORCES** About Newton's laws of motion How to calculate the weight of an object from its mass The factors affecting the stopping distance of a vehicle About the dangers of large decelerations How to calculate momentum, and apply ideas about momentum to collisions	**RADIOACTIVITY** How the particles inside atoms are arranged How the theory of the Bohr atom was developed How to represent atoms using symbols About the different types of radiation and how they affect atoms About the background radiation that is all around us How radiation is detected The uses of radioactivity in the home and industry About the dangers of radiation and how we can protect ourselves, half-life **REVISION** (Cont. Phase 3
Phase 3	**7G – THE PARTICLE MODEL** This unit develops an understanding of the different properties of solids, liquids and gases. Scientific method and ideas on experiments, observations, hypotheses and theories are discussed, leading to an understanding of the particle theory of matter. **7K – FORCES** This unit revises the concepts of forces and their effects and extends students' knowledge of friction, gravity and springs. These ideas are presented using a theme of outdoor sports, such as climbing and mountain biking, to link to ideas about forces, friction and pressure. **8I - FLUIDS** This unit looks at changes of state, and then goes on to look at fluids and some of their effects, including pressure, floating and sinking, and drag.	**8D – UNICELLULAR ORGANISMS** Under the broad theme of their uses, this unit takes a detailed look at what unicellular organisms are, the differences between different types, their problems and their uses. **8C – BREATHING AND RESPIRATION** Under the broader theme of water sports, this unit covers gas exchange in humans and other organisms, together with details of aerobic and anaerobic respiration in humans. **9B – PLANT GROWTH** This unit looks at photosynthesis and aerobic respiration in plants in more detail, and then considers plant adaptations. The products we get from plants are then looked at, before studying farming methods and their problems.	**WAVES 1** How to describe Transverse and Longitudinal waves That waves transfer energy and information without transferring matter How to describe the characteristics of waves How the speed of a wave is related to its frequency and wavelength, and to the time it takes to travel a certain distance How sound waves are produced How sound is used in echo location **EM SPECTRUM** (Cont. Phase 4) That light is part of a family of waves called the electromagnetic spectrum, which all have some properties in common Some of the uses of waves in the different parts of the EM spectrum Some of the harmful effects of waves in different parts of the EM spectrum About some of the factors that affect the temperature of the Earth	**ELECTRICITY – TRANSFERRING ENERGY** About the UK domestic electricity supply and electrical safety features in homes How earthing works and why it is important **MAGNETS AND MAGNETIC FIELDS** About permanent and induced magnets, and how to represent a magnetic field About the magnetic field around a current in a wire and the factors that affect it How the fields from the individual coils in a solenoid interact How to work out the size and direction of the force on a wire carrying a current in a magnetic field	**REVISION** (Cont. Phase 4)
Phase 4	**8A – DIGESTION & BALANCED DIET** This unit looks at the main components in the human diet and why they are needed. The digestive system is also covered in some detail, and the idea of enzymes is introduced. **7B – ASEXUAL & SEXUAL REPRODUCTION** This unit explores sexual reproduction in animals, in the context of efforts being made by zoos to prevent endangered species becoming extinct. However, the central focus for learning is the human reproductive system and sexual reproductions in humans. **7J – CURRENT ELECTRICITY** This unit looks at the measurement of current and how it behaves in series and parallel circuits, and at voltage and resistance. Various models for thinking about what is happening in circuits are explored, and the unit concludes by looking at how we use electricity safely.	**8F – THE PERIODIC TABLE** This unit examines and strengthens the students' understanding of matter, atoms and chemical and physical change. Students then look at using the trends in the periodic table to make predictions about physical and chemical properties of elements and their compounds. **8G – MTEALS & THEIR USES** This unit builds upon the students' knowledge and understanding of common physical properties of metals, and to introduce their main chemical properties. The idea that reactions can occur at different speeds is also illustrated, leading to the introduction of the general reactivity series of metals. **9F – REACTIVITY** This unit reviews physical change and gas pressure, and then the reactivity series and a chemical method of preventing rusting are covered. Exothermic and endothermic reactions are introduced, followed by displacement reactions. Calculation of percentage change is related to oxidation and thermal decomposition reactions.	**ELECTRICITY AND CIRCUITS** Current, Charge and Potential difference Series and parallel circuits How to calculate resistance, power and energy transferred The components which have changing resistance	**MAGNETS AND MAGNETIC FIELDS** About permanent and induced magnets, and how to represent a magnetic field About the magnetic field around a current in a wire and the factors that affect it How the fields from the individual coils in a solenoid interact How to work out the size and direction of the force on a wire carrying a current in a magnetic field **FORCES AND MATTER** About elastic and inelastic distortion The relationship between force and extension, and how to calculate the extension and spring constant How to calculate the work done when stretching a spring	**STUDY LEAVE**
	END OF YEAR EXAM	**END OF YEAR EXAM**	**END OF YEAR EXAM**		
	7D – ECOSYSTEMS With a general theme about adaptations, this unit looks at ecosystems and the factors that affect them. This includes the impact of human activity and the importance of biodiversity.	**8L – EARTH & SPACE & 9I FORCES** This unit builds on work from KS2 on the Solar System and looks at the Earth, including the seasons and the Earth's magnetic field and gravity. It also looks at the Solar System and what is beyond the Solar System, whilst revising some aspects of forces and their effects, energy stores and transfers. It then looks at calculations of speed and relative speed and representing journeys on distance-time graphs.			