Goldwyn Ashford - Science

Subject Statement and Long Term Plan

Science – Statement of Intent

The intent of our Science curriculum at Goldwyn school is to develop scientific knowledge and key concepts through the specific disciplines of biology, chemistry and physics.

Students will develop the understanding of the processes and methods used in Science to help them to answer scientific questions about the world around them. Students will have the opportunity to achieve skills, knowledge and understanding through practical based learning.

Students will study the Exploring Science curriculum in years 7 and 8. This will introduce them to key concepts in Science, such as The Circulatory System, The Particle Model and Electricity. In year 9 students will begin the Edexcel Combined Science curriculum, where they will build upon the key concepts introduced in year 7 and 8. We encourage students to be inquisitive in Science through their learning journey at Goldwyn School. We ensure that the practical work and theory is developed throughout their time at school so that students can apply this knowledge of Science when using equipment, conducting experiments and explaining concepts.

Teachers use a wide range of strategies within class to allow all students the opportunity to achieve. Science will be taught through planned topics that are sequenced to ensure that students build upon and re-visit topics to enhance subject knowledge to achieve a greater depth of understanding. This will also enable students to make further progress, advancing their knowledge at a deeper level within Science.

Science: Long Term Plan

Term	1 Knowledge, Skills and Understanding	2 Knowledge, skills and Understanding	3 Knowledge, skills and Understanding	4 Knowledge, skills and Understanding	5 Knowledge, skills and Understanding	6 Knowledge, skills and Understanding
Year 7	**Mixtures and seperation** 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. **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 also introduces standard hazard symbols.	**Cells, tissues, organs and systems** This unit starts by reminding students about the features of organisms, and then looks at organs, tissues and cells. These ideas are then built back up in order to look at organs once again, in the context of organ systems. Throughout the unit, students are encouraged to compare what we know now about the structure of organisms with what people believed in the past. The theme of Ancient Egypt helps to thread these ideas together. **Muscles and Bones** This unit uses a 'fitness' theme to cover three important organ systems: the gas exchange system, the circulatory system and the locomotor system. The various effects of drugs on these systems are also considered, together	**Sexual reproduction in animals** 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 reproduction in humans. **The Particle Model** This unit develops an understanding of the different properties of solids, liquids and gases within the context of waste management and disposal. Scientific method and ideas on experiments, observation, hypotheses and theories are discussed, leading to an understanding of the particle theory of matter. Further applications of the particle theory are investigated using the context of waste and waste disposal.	**Atoms Elements and Compounds** This unit will cover elements we may discover on our planet, from the air we breathe to metals and nonmetals, and being able to identify chemical reactions **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.	**Sound** This unit looks at how sounds are made, transmitted and detected; some uses of sound and compares sound waves with waves on the surface of water. **Ecosystems Mixtures and Separation.** With a general theme about explorers, this unit looks at ecosystems and the factors that affect them. This includes the impact of human activity and the importance of biodiversity.	**Energy** This unit uses a theme park to introduce the idea that stores of energy are needed to make most things happen. It looks at food, energy stores and transfers, and energy resources in terms of non-renewable fuels and renewable resources. **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.

		with their effects on the nervous system.				
Year 8	**Combustion** This unit uses the context of combustion engines to cover 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 emissions. **Food and Nutrition** 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.	**Unicellular organisms,** Under the broad theme of diseases, this unit takes a detailed look at what unicellular organisms are the differences between different types, their problems and their uses. **The Periodic Table** This unit uses the context of fireworks to develop 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.	**Metals** This unit uses the context of combustion engines to cover 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 emissions. **Breathing and Respiration** Under the broad theme of water sports, this unit covers gas exchange in humans and other organisms, together with details of aerobic and anaerobic respiration in humans.	**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. **Energy Transfers** The unit is set in the context of stage, film and illusions. **Earth and Space** 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. The theme is exploring the Solar System – in terms of observations and the use of models as well as via astronauts and space probes	**Plants and their reproduction** This unit covers reproduction in plants, both sexual and asexual, although the former is of chief importance. Classification and biodiversity are also covered. The theme that is threaded through the unit is the various uses that we have for plants.	**Rocks** This unit examines the different types of rock and the processes that bring about their formation, leading to the idea of a rock cycle that operates within a huge geological timescale. It also looks at the Earth as a source of resources and the advantages of recycling metals. The unit is set in the context of natural disasters. **Fluids** This unit will expand upon the particle model taught in year 7, and link it to what causes atmospheric pressure, drag and why things float or sink
Year 9	**Biology**	**Chemistry**	**Physics**	**Biology**	**Chemistry**	**Physics**

GCSE	**Key Bio Concepts** In this topic students discover the basics of Biology. They learn about different types of cells and how they become specialised. They will also cover enzymes; how they work and what affects them. Finally they learn about Diffusion, Osmosis and Active transport. **Cells and Control** Here we learn cover how small organisms become complex organisms. We look at the mitosis process and how cells grow in plants and animals. The use of stem cells is covered and the how the nervous system works.	**States of Matter** **Separation Techniques** In this topic students learn about different states of matter. They get the opportunity to understand about different ways of separating mixtures (Filtration, Crystallisation, Chromatography, and Distillation). They also get the chance to see how this is used in real life by making water clean to drink. **Atomic Structure** **The Periodic Table** **Groups in periodic Table** This unit covers the atom. Firstly the discover the atomic structure and how difference create different atoms and isotopes. Then they look at the arrangement in the periodic table and how atomic number decides where it goes. Students get to calculate atomic and mass numbers and learn how to read the periodic table.	**Motion** In this topic students have the chance to learn about the difference between vectors and scalars. They also understand the difference between distance time graphs and velocity time graphs. Finally they learn about speed, velocity and acceleration. **Forces and motion** In this topic students will learn about Newton's 3 laws and how they can be applied. They will discover the difference between Mass and weight and learn some bits about the different planets. Finally they will learn about Momentum and how this can be applied to vehicles regarding stopping distances and crash hazards.	**Genetics** Here we build on variation, fertilisation and DNA. Students will learn how gametes are produced by meiosis. They will learn about the structure of DNA and how mutations can cause genetic variation. We learn about genetic diagrams and how certain characteristics are passed down through families. **Natural selection and Genetic Modification** Building on evolution from KS3 we cover how Darwin formed his theory from natural selection. We look at how evolution is being investigated using genetic analysis. We learn how genetics are used to classify organisms, cause selective breeding and how genetic modification is done.	**Ionic Bonding** **Covalent Bonding** **Types of Substance** In this unit students understand how atoms react with each other. They learn about the different bond types and what structures they form. They also learn the properties of the different bond types and the properties of metals. Allotropes of carbon is also covered	**Energy – Forces** **Forces and their effects** Linking to previous topics 2 & 3 but building on. Students cover work and power and their calculations. They learn work in terms of energy and force x distance. They interpret vectors and learn how to draw their own. Gravitational and magnetic forces are covered here as well. **Conservation of Energy** Here students will learn about Energy in the modern world. They learn the differences between renewable and non-renewable energy sources as well as the advantages and disadvantages of each. They discover concepts like efficiency and how energy is stored and transferred to other stores. In this topic there is a specific focus on 3 different heat transfers.

Year 10 GCSE	**Biology** **Health, Disease and Medicine** Building on diets and health from KS3. Also linking to CB1. In this unit we define Health. We learn how pathogens cause disease and how they can be spread and prevented from spreading. We learn how the body protects against infection using the immune system and antibiotics and medicines. **Plant Structure and Functions** Here students add to what they learned from CB1 and photosynthesis from KS3. We learn more about photosynthesis and what affects the rate of it. We learn how water uptake is affected by different factors. We learn about the transport in plants for reactants and products and how specialised cells are used in plants.	**Chemistry** **Mass Calculations** **Electrolysis** **Obtaining Metals** **Equilibrium** Having learned about balancing equations students learn about how mass is conserved and how to calculate empirical formula. Calculations of concentrations and how much product is produced. If they are higher they learn about molarity and number of moles. They will also learn about oxidation and reduction, the different ways metals can be extracted and recycling metals. Finally the topic covers electrolysis again and equilibrium in chemical reactions. (Haber process).	**Physics** **Waves** Short topic where students describing a wave. They learn wave speed calculations and how to manipulate them. They also learn concepts of reflection, dispersion and refraction. **Light and EM Spectrum** Short topic covering the EM spectrum. The Uses and Dangers of the different sections of the spectrum.	**Biology** **Animal co-ord, control and Homeostasis** In this unit students learn more about obesity and human reproduction. They learn about the endocrine glands and how hormones are transported to target organs. We develop an understanding of how hormones are used to control the menstrual cycle as well as blood glucose concentration and diabetes. **Exchange and Transport in Animals** Previous learning here comes from digestive and respiratory systems. Here they learn more about diffusion, gas exchange and surface area: volume ratio. They learn more about different types of respiration. Finally they cover how lungs blood vessels and blood are adapted for their function and the cardiac output	**Chemistry** **Acids and Alkalis** Here students build on KS3 model of pH scale. They discover different types of indicator and how the atoms affect a substance to be acidic or alkali. If they are higher ability the look at how pH is determined by concentration of ions. They learn about complete a required practical of making soluble salts (copper sulphate). When learning about acids and alkalis students learn the naming process as well as the way to balance equations. A neutralisation practical is carried out while students can learn about the chemistry of neutralisation and titration. This leads to an understanding of solubility and which compounds are soluble in water. Finally students learn about how acids	**Physics** **Particle model** **Forces and Matter** Particle model is revisited from KS3. Learn about Density and how heat can change states. Heat capacity and latent heat are covered here. This leads on to gas temperature and pressure. Hooke's Law is also covered and properties when objects are bent and stretched (elastic/plastic). Finally they look at the energy involved in stretching springs

					react with metals and carbonates.	
Year 11 GCSE	**Physics** **Electricity and Circuits** Big unit covering how circuits work. Understand what a complete circuit is and its different components. While doing this Current, Voltage and Resistance are covered. Focus on Resistors in series and parallel as well as diodes, LDR and Thermistors. When they have developed a base of current, voltage and resistance they learn Power. This leads to AC/DC and the national grid. Finally they look at the safety required around different types of electrical supplies.	**Physics** **Magnetism and Motor effect** **EM Induction** Magnetic properties and fields are covered here. We also look at the forces caused from magnets. The link between magnets and electricity is covered and how transformers can be used. Again we look at how the national grid is works.	**Chemistry** **Revise Ionic Bonding** **Covalent Bonding** **Types of Substance** In this unit students understand how atoms react with each other. They learn about the different bond types and what structures they form. They also learn the properties of the different bond types and the properties of metals. Allotropes of carbon is also covered **Biology** **Revise Key Bio Concepts** In this topic students discover the basics of Biology. They learn about different types of cells and how they become specialised. They will also cover enzymes; how they work and what affects them. Finally they learn about Diffusion, Osmosis and Active transport. **Cells and Control** Here we learn cover how small organisms become complex organisms. We look at the mitosis process	**Core practical catch up and revision**	**Core practical catch up and revision**	

			and how cells grow in plants and animals. The use of stem cells is covered and the how the nervous system works.			