

Year 10

Autumn Term

Students revisit biology by extending their knowledge of cells. They will learn about the process and importance of mitosis in growth and repair and consider the importance of monitoring growth as we develop from infancy to adulthood. Students also learn how plants and animals grow differently which explains the relatively finite nature of animal life. Knowledge of stem cells and their potential are explored as a revolutionary, but controversial, form of medical intervention as are the way in which specialised cells in the nervous system work to bring about reflex reactions that help organisms survive the trials of life.

In physics we build on the topic of motion and forces by comparing how to define and calculate speed and velocity as scalar and vector quantities respectively. Students will extend their understanding in this area by learning about average and uniform acceleration and Newton's laws of motion and will also start to gain an appreciation that proportionality is an important aspect of many mathematical models which we explore through Newton's second law: $F = ma$.

Continuing with Physics, the topic of energy is reintroduced, building on KS3 learning about how energy is transferred and stored. Students will use equations to calculate efficiency, gravitational potential and kinetic energy and will evaluate the use of renewable and non-renewable energy resources, a topic of great significance in light of the global energy crisis.

The final physics topic of this term is waves and builds on KS3 understanding of the nature of light and sound waves and their behaviour. Our knowledge of waves has enabled us to develop a range of scientific insights ranging from the origin of our universe to the cause of earthquakes. In this topic students will again build on their mathematical skills by using and rearranging equations to calculate wave speed, frequency and wavelength using standard form and will also begin to use more sophisticated language when describing transverse and longitudinal waves. They will also develop their practical skills by investigating the behaviour of waves in solids and liquids to show how scientists can understand highly abstract concepts through simple practical models.

In chemistry students will build on knowledge gained in year 9 of atomic structure and the periodic table. They will now begin to understand how atoms bond by sharing or transferring electrons and how the shapes of molecules and the arrangement of giant structures have great importance in determining the way they behave. This topic lays the foundations for understanding the concepts of electrolysis and reactivity later on in the course.

In biology students build on their knowledge of causes of variation, inheritance and sexual reproduction and will begin to explore how the characteristics of a living organism are influenced by its genome and its interaction with the environment. New concepts covered include meiosis as a significant source of variation, the structure of DNA and the role of mutations in producing variation.

Notes regarding 2021-22.

Due to the disruption caused by the pandemic the department has had to change the teaching order of some topics. For this year, students are not covering the structure and bonding unit or the waves unit this term. Waves were covered last year in Year 9 and bonding will be covered next term. Students instead are having the opportunity to carry out many of the core practicals that they were

not able to last year - filtration and chromatography, investigating pH and enzyme activity and also osmosis in potatoes. There is also ample opportunity for interleaving of previously taught topics.

Spring term

The term starts with a return to biology and its most iconic molecule - DNA. They learn how DNA is responsible for the characteristics of organisms but extends this to explore Darwin's theory of evolution by natural selection and how it accounts for both biodiversity and the fact that all organisms are related to varying degrees.

Biology then moves onto the study of plant structures and their functions which builds on both KS3 knowledge of photosynthesis and KS4 knowledge of the structure of plant cells and how they are specialised for their functions. Plants sustain almost all known food chains on planet earth and have to carry out every living process that animals do whilst being anchored to one location so students extend their knowledge by learning how plants are adapted to feed themselves through photosynthesis, including the factors that affect the rate at which this process occurs. They also learn how plants acquire water for transport, growth and support. This topic lays the foundations for some of the work in the later biology topic on ecosystems.

Chemistry continues with chemical calculations, a topic that brings students back to their learning from KS3 regarding the use of chemical symbols when describing chemical reactions and now extends it using information from the periodic table to calculate reacting masses, empirical and molecular formulae and concentrations of solutions. Avogadro's constant and the mole are also met for the first time in this topic and students will practice applying this in context. The mole will evolve their understanding of balanced symbol equations and the law of conservation of mass. Chemistry then revisits reactivity from KS3 where students build on this knowledge and their knowledge of ions to examine electrolytic processes, which have many important everyday uses such as batteries to power electrical devices to electroplating. This topic will lead into next term's learning on extraction of metals.

In Physics the novel topic of radioactivity is introduced. This builds on KS3 knowledge and understanding of the particle model of matter and also knowledge of atomic structure gained in chemistry last year. Students will gain an understanding of the different types of radiation and how they affect atoms as well as the uses and dangers of radiation and how we can protect ourselves. Students will develop an understanding of how radioactivity is used in carbon dating, a technique that has enabled us to understand planet Earth's natural history, and in light of the global energy crisis, why nuclear power may be a viable alternative to burning fossil fuels.

Notes for 2021-22

The chemistry topic on structure and bonding is now being taught this term instead of in the Autumn. The acids and bases topic has been brought forwards one term and will now be covered in the Spring not the Summer. In addition the biology topic on health and disease was not taught during Year 9 and so will now be taught in the Spring term instead. This means that the plants and photosynthesis topic will now be taught in the summer term. As before there is also ample opportunity for interleaving of previously taught material.

Summer term

In the topic of acids and alkalis, material from KS3 is revisited such as the use of indicators, the pH scale and simple neutralisation reactions, however, now the focus is on explaining differences in pH and the reactions between acids and different types of bases to make salts. Salts have tremendous commercial value through their use in the food and pharmaceutical industry as well as in agriculture. Practical work involves making samples of soluble and insoluble salts to model how salts are obtained and purified so they are ready for use.

Leading on from the work on electrolysis last term, students will explore how we obtain and use metals, including evaluating the value of recycling metals. Continuing with the theme of chemistry as used in industry, students will then learn about the importance of reversible reactions, including that of the Haber process in the production of ammonia which revolutionised how we mass produce food to feed our exponentially growing population.

Chemistry continues to build on knowledge of the periodic table gained in year 9 and now moves focus to describing and explaining the properties of specific groups of chemicals that share similar properties: group 1 (alkali metals), 7 (halogens) and 0 (noble gases). Students will gain further opportunities to practice writing balanced symbol equations including state symbols. Continuing with chemical reactions, factors affecting the rate of reactions are explored during both practical and theory work, as are the energy changes that occur during chemical reactions. Chemical reactions are often carried out to yield products of commercial value. Understanding how specific factors, such as temperature and surface area, affect the rate of chemical reactions enable chemists to ensure product yield and profit is maximal.

In Physics the topics of energy and forces are revisited and extended and students will consider the law of energy conservation through examining how energy is transferred in a system and how to calculate the rate of transfer, as well as then exploring how contact and non-contact forces affect objects.

Notes for 2021-22

The plants and photosynthesis topic is now being taught this term and the acids and bases topic was covered in the Spring term. Due to reconfiguration of lessons we also have time to teach the biology topic on hormones and homeostasis during this term.