Science

Teaching British Values through Science

*The science curriculum is designed to enable students to be curious and discover new ideas and test theories. This discovery encourages the development of a student’s self-confidence and their self-esteem.*

*Throughout the science curriculum, students are challenged to think about their opinion of a particular aspect or theory, but also to evaluate the moral, ethical and social implications. An example of this is the study of stem cell therapy and genetic engineering. Students are encouraged to reflect on their own thoughts about the advantages and disadvantages of these medical innovations, but also to evaluate other cultural and religious viewpoints.*

*The science curriculum promotes British values through advocating and teaching acceptance of all individuals, regardless of their differences and potential disabilities. This is particularly relevant during the teaching of genetic disabilities, embryo screening and discrimination. Students are encouraged to respect all opinions and viewpoints with regards to the diagnosis and treatment of all medical conditions. These topics build on tolerance and harmony, enabling students to acquire an appreciation for and respect for their own and other cultures.*

**Key Stage 3**

**Year 7**

In year 7, students will be introduced to the fundamentals of biology, chemistry and physics. Students will learn about the structure of a cell; using microscopes to view tiny cells. In Biology, students will learn how the food you eat is digested and absorbed into the body, as well as the effect of alcohol and smoking on your health. Students will be challenged to learn what makes the universe and everything in it, discovering about the structure of an atom and the three states of matter. They will carry out introductory chemical reactions, observing how certain molecules react with each other. In Physics, students will study the different types of energy and discover how energy is required for anything to work. Students will be able to describe the effect that forces have on objects and on the Solar System.

Year 8

The year 8 curriculum builds on the foundations of science that were learnt in year 7. Students will continue to look at how the human body functions, discovering how humans respond to microbes and disease and how the immune system protects you from illness. Students will be educated in the skeletal and muscular system and learn about the process of respiration; how humans produce the essential energy required to survive. In Chemistry, students will gain knowledge of chemical reactions, in particular the reactions of metals and non-metals, and acids and alkalis. Students will be challenged to complete chemical equations to show what happens in a reaction. They will also discover how the Earth was formed and how it has changed over time because of volcanic eruptions and tectonic plates. In Physics, students will learn about the electromagnetic spectrum. They will discover how humans hear and how sound is transmitted. They will learn how the eye works and how humans can see different colours in different amounts of light. Students will learn about electricity. How it was discovered, how it is generated and why it is so important.

Year 9

In year 9, students will begin to investigate more complex scientific theories, preparing them for the start of the GCSE course at the end of the year. In Biology, students will investigate how the digestive system functions, interpreting how enzymes function. Students will begin to look at genetics. They will learn about the importance of genes and how they have changed over time, leading to the evolution of new species. In Chemistry, students will complete a number of practicals to investigate how materials react with each other. Students will be required to interpret their results from observations that they take. Students will learn how to produce more complex chemical equations, using the periodic table to produce symbol equations. In Physics, students will combine their knowledge of forces and energy to investigate how magnets and electromagnets work. They will calculate speed and acceleration, using graphs and complex formulae.

Key Stage 4

In year 10, students choose whether they would like to follow the double science or the triple science GCSE route. The triple science GCSE route is favoured by Sixth Form colleges and Universities because of the level of challenge and skill development. Students who choose the triple science route will gain three GCSEs; one in Biology, one in Chemistry and one in Physics. The double science route is the more traditional science route. Students will still study Biology, Chemistry and Physics but will gain only two GCSEs. These GCSEs are combined science GCSEs where students are tested on their understanding of all three sciences.

Year 10 Biology

The year 10 Biology course focuses on the human body and the world around us. Students will be challenged to think about how species differ from each other, how they are classified and how they have evolved over millions of years. Students will also learn about the intricacies of the nervous system and the immune system.

Year 10 Chemistry

Year 10 Chemistry focuses on the main chemical reactions that occur all around us every day and the impact that they are having on the environment. Students will learn about the development of the universe, from the simple atom to the development of the atmosphere. They will then investigate a number of complex chemical reactions, investigating how they work, what is produced and how chemical equations can be used to express what happens in a reaction. Students will study how crude oil is extracted and broken down into the many useful substances that we use. They will also look at the impact of combustion and cracking.

Year 10 Physics

In year 10, students will discover how information is transferred from one place to another. They will study the electromagnetic spectrum, focusing on how light is transmitted, reflected and refracted. They will also look at the impact of waves in modern society, identifying the use of waves in ultrasounds and the effect of waves in earthquakes. The second part of the year 10 Physics course focuses on energy. How energy is transferred and how electrical energy is produced, consumed and its cost.

Year 11 Biology

In year 11, students will discover how advances in modern science are driving improvements in medicine and biology. Students will find out about the amazing potential of stem cell technology and genetic engineering. They will also learn about the three most important chemical reactions in nature; respiration and the production of energy, photosynthesis and the production of glucose, and digestion.

Year 11 Chemistry

The year 11 Chemistry course delves deeper into chemical reactions and the properties of all of the materials in the world. Students will analyse how metals, non-metals, halogens, acids, alkalis and noble gases react with each other. They will interpret data on rates of reactions and be challenged to think about how a chemical reaction can be sped up. They will also link chemical reactions to industry.

Year 11 Physics

At the beginning of year 11, students will continue to look at electrical energy, focusing on electrical circuits and calculations involving current, voltage and resistance. Students will then focus on the effect a force has on an object. Students will interpret speed, distance and time graphs, calculating resultant forces, velocity, acceleration and momentum. The final part of year 11 allows students to learn about the use of nuclear radiation. Students will learn how nuclear reactors are designed and how powerful nuclear energy can be, as well as how dangerous.

Key Stage 5

A Level Biology

In the first year, the students will be examining the structure of biological molecules, cells and gas exchange systems.  Students will use microscopes to create slides of different animal and plant tissues.  Students will get the opportunity to study the gas exchange systems of human, fish and insects. Whilst examining this topic, they will get the opportunity to dissect a fish and the mammalian breathing system.   Genetics is an increasingly important part of science hence the genetic information module will allow students to describe the structure of DNA, what genes are and how genes code for polypeptides.

In the second year of their course, students will revisit familiar topics such as photosynthesis and respiration.  Students will be asked to explain how plant leaves are adapted to carrying out photosynthesis. The majority of the second year revolves around human biology. Students will learn about the intricacies of the human nervous system and endocrine system, investigating the impact of certain drugs on the human body. The final part of the year 13 course is genetics and advances in medical biology such as gene therapy and stem cell technology.

Studying A-Level Biology will improve student’s research, problem solving, organisation and analytical skills. Studying A-Level biology will enable students to apply for courses in medicine, dentistry, forensic science, psychology, physiotherapy, botany, environmental science, zoology, oceanography, pharmaceuticals, energy, teaching, science writing, genetics and research.

A Level Chemistry

Chemistry is the study of the material world.  It underpins many aspects of our lives from the pharmaceuticals and medicines we use to heal, to plastics used in everyday objects.  Students considering studying either a physical or biological science degree at university should consider taking Chemistry at A level.   The study of Chemistry enables students to develop a logical approach to problem solving and learn to apply concepts to new situations.  Through practical work in new laboratories, students will develop their observational and analytical skills.

At A level, students study the three main branches of Chemistry; Organic chemistry with its links to the biological world, Physical chemistry where students’ mathematical and problem solving skills will be tested and Inorganic chemistry looking at trends in the properties of elements and compounds.

In the first year, students learn fundamental chemical concepts including atomic structure, calculations in Chemistry and the nature of bonding in compounds and molecules.  Students then apply this knowledge to different fields such as rates of reaction, equilibria and organic compounds and their reactions.   Students build on first year knowledge in the A2 year through more advanced topics including redox reactions, thermodynamics, transition metal chemistry and organic chemistry such as aromatic compounds, the carbonyl group, and amino acids including links to proteins and related biological molecules.  Students undertake practical work alongside lessons in chemical theories during the course of A level.  By the end of the course students will have developed the skills required to go on to study Science at university.

A Level Physics

At AS level, students will meet the mechanics concepts central to understanding physics, including conservation of energy, momentum, moments, dealing with vectors, resolving forces on objects and the properties of materials including electrical conductivity. They will be able to describe the motion of an accelerating object with mathematical accuracy and take measurements of the Earth’s acceleration due to gravity using various experimental means. Students will also learn the fundamental structure of our universe; the particle composition of matter and the methods we used to gain knowledge about the realm of the very small.

Building on the AS year, at A2 students will grapple with advanced mechanical concepts including circular motion, simple harmonic motion and the motion of objects in gravitational, electric and magnetic fields. These key skills will set students up to undertake study at university on any mathematical or engineering subject. Students will learn how we arrived at our current model of the atom, and how we use our knowledge of the structure of nuclear matter to extract energy from practical nuclear fission and fusion reactors. Students will also have access to an option topic at A2 which will be one from A –Astrophysics B - Medical Physics or C - Turning points in the history of physics.