

## Science Faculty Rationale

**Our vision is to support young people to become independent and enthusiastic scientists.**

We want our students to be confident, resilient, problem solvers who are scientifically literate and numerate.

## National Curriculum Aims KS3

The national curriculum for science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

YEAR 7	Biology Content and Rationale	Chemistry Content and Rationale	Physics Content and Rationale	Scientific Skills Development
Concept 1		<p><b>Introduction to Lab Work</b></p> <p>This unit is the first unit for all students on their arrival at HHS. It initiates the development of laboratory skills and is a level-playing field with which to start as students coming from KS2 usually have very similar prior experience. This is important as the first unit is taught in the context of mixed ability form groups rather than ability sets.</p> <p>Students first learn about safety in the laboratory before looking at a range of lab and scientific skills which provide a basis for the study of all of the Science topics which come afterward.</p>		

<p>Concept 2</p>	<p><b>Cells</b></p> <p>'Cells' introduces students to the fundamental building block of life. We teach cell structure and specialisation as well as an introduction to the <b>movement</b> of substances into and out of cells. Their knowledge of cell structure will form a framework for an understanding of how tissues and organs are built later on in the course. Teaching diffusion allows students to more easily look at digestion and gas exchange further on and supports their understanding in Chemistry.</p>		<p><b>Forces</b></p> <p>Each year of the KS3 curriculum in Physics uses the same four fundamental units in sequence. The first of the four fundamental concepts is 'Forces' and in Year 7 and 8 this involves the study of topics which link clearly to the KS2 curriculum, namely Speed and Gravity. These take concepts are familiar and logical to students and build in some of the thought processes that are required to as the course becomes more abstract. It also allows fundamental misconceptions such as the confusion between weight and mass to be addressed forthwith.</p>	
<p>Concept 3</p>		<p><b>Further Introduction to Lab Work</b></p> <p>The first term ends with a unit introduced to ensure that the laboratory skills which we focused on at the start of the course are reinforced before Christmas and especially after the first two units of Cells and Forces have been completed in classes setted by ability. The aim here is to ensure that the teacher is confident that the students have begun to develop a working ability to carry out practical tasks and that the journey towards independence has been begun with a clear understanding of variables, repeats, drawing tables, drawing graphs and analysing result to develop conclusions.</p>		

<p>Concept 4</p>	<p><b>Systems</b></p> <p>'Systems' introduces students to the fundamental concepts of how the skeleton and muscles enable locomotion at a macro level. It then introduces students to two systems which will be key throughout the 7-13 pathway in looking at nerves and immunology. Both are engaged with at an appropriate level but the most able will interlink with concepts which we start with in Year 9. This builds on cells and tissues work carried out in the first unit and presents the body as a network of systems.</p>	<p><b>Particles</b></p> <p>Particle Theory is the fundamental keystone of Science and we introduce the concept of 'theory' and 'observation' before showing how the two can be combined to explain the states of matter. We then build on this to show students that particle theory can explain melting, freezing, boiling and evaporation as changes of state, the visible effects of air pressure and observations on diffusion. The latter ties directly to work completed in 'Cells' and the rest underlie work to come across all three subject areas.</p>	<p><b>Electromagnetism</b></p> <p>The study of electromagnetism begins with electricity and electrical circuits. This is taught very much from a practical perspective and students will be introduced to concepts of voltage and resistance in circuits before building up to the introduction of current as a concept in the second half of the unit. Past experience shows that the practical side of electrical circuitry is an area less well developed by many of the feeder schools and this factor is tackled by ensuring a clear focus on underpinning theory with kinaesthetic activity.</p>	
<p>Concept 5</p>	<p><b>Reproduction</b></p> <p>'Reproduction' is a unit which we believe plays a key role in not only the scientific but also the personal health education of students. We introduce it as soon as the groundwork for learning has been laid so that students can understand the concepts involved from both a cellular and systematic perspective. We introduce the aspects of the topic which will be built on further on in the 7-13 pathway but also take time to cover gestation and birth as well as looking at reproduction in plants.</p>	<p><b>Pure and Impure Substances</b></p> <p>Using the understanding of the concepts laid down in 'Particles', students study mixing and separating substances. This follows a practical approach which underpins the Yr 7-13 pathway in Chemistry and across KS3 science. Within this unit, students are introduced to solutions and solvents, filtration and evaporation, distillation and chromatography as ways of separating substances from one another. Students are challenged to show mastery of the individual concepts in a final practical where all are brought to bear in a single investigation.</p>	<p><b>Energy</b></p> <p>This unit takes the course into more abstract territory as for the first time students deal with the idea of describing everyday actions in the context of energy changes. Beginning with simple flows that are based in the speed, gravity and electrical circuits already covered, the course builds toward an understanding of more difficult idea of potential energy in its different forms and how it can be transferred to 'useful output. This is tied together and to some extent normalised by an appreciation of the costs of electrical energy from a household perspective.</p>	

<p>Concept 6</p>		<p><b>Simple Chemical Reactions</b></p> <p>Students approach chemical change having encountered the full range of physical changes and their associated supporting theory in 'Particles' and 'Pure and impure substances'. This unit begins by making clear the difference between physics and chemical changes before moving onto look at a range of chemical changes which they will encounter in ever greater detail as they move through the 7-13 pathway. There is a focus on areas where misconceptions are known to occur later on, seeking to lay good fundamental understanding of endo &amp; exothermic reactions, oxidation &amp; rusting and combustion &amp; thermal decomposition as distinct pairs of ideas.</p>	<p><b>Waves</b></p> <p>The final core concept is that of waves. Students will already have a basic perception of lights and sound from the energy topic, but will at this stage be introduced to the idea that light and sound can be thought of as waves and can be shown to have properties which rely on this conceptual understanding. Sound is introduced as the simpler and more familiar topic and underlies the later understanding of light.</p>	
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