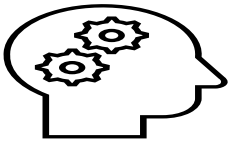
Purpose of Study

The Wintringham science curriculum will allow students to develop a broad level of understanding about natural phenomena occurring in the world around them. Our exciting 5 year curriculum covers and exceeds the national curriculum core composites, encouraging both knowledge and disciplinary skills development, with a clear focus on practical elements of working scientifically. Reading underpins the evolution of learning in science, with a relentless focus on the use of subject specific vocabulary, making and recording observations, analysing data and forming knowledgeable evaluations.

Throughout the 5 year curriculum, students experience teaching and learning in topics covering Biology, Chemistry and Physics and the sequencing of lessons provides a clear structure for knowledge to be acquired, applied and recalled. The spiral nature of knowledge progression is deep rooted in the curriculum and every unit of work is clearly mapped through the key stages, allowing our students to be equipped with powerful and essential world knowledge.

The delivery of the curriculum through core composites our students develop in character, building confidence in practical skills, resilience when faced with challenges and develop oracy through verbal reasoning and debating. These skills pave the way for our students to make contributions to the 'Great Grimsby' local community and we are committed to ensuring that they are equipped with the knowledge, skills and qualifications to reach their potential.

Character:
Student's character is developed through building positive relationships with staff and students. A balance of exposition and discussion allows exploration of the human, animal and material world. Students grow in their ability to conduct experiments as part of a group and to experience other people's viewpoints when considering ethical dilemmas. Distinct links between aspects of the science curriculum and personal development allows a fundamental understanding of health and wellbeing, the environment and ethical issues to be secured within different contexts.



Competence:
Our curriculum model builds upon student's prior knowledge and skills in a progressive spiral manner. This allows students to develop further understanding and make links between different types of subject matter, whether this is a real life application or theoretical understanding. Students practice application of understanding in various contexts to provide opportunities to deepen understanding and refine practical skills.

Community:
The broad nature of our science curriculum encourages the transition from student's core knowledge of science to application in real life contexts, including local and global issues. Issues of climate change, loss of biodiversity, pollution, energy resources and extracting finite resources are all fundamental regional and global issues. Students relate their knowledge to these issues and through teaching of potential solutions, students are provided with belief that science gives us the opportunity to change and transform our world.

Progression in science

Our curriculum is designed and sequences to ensure that knowledge is developed and built upon, over time. Opportunities for retrieval practice are embedded in every lesson to ensure subject mastery and flexibility of knowledge.

- **Secure substantive knowledge:** Through the development of secure understanding students are able to explain the scientific principles. Core concepts are revisited and build upon to ensure students engage with these ideas in a range of contexts.
- **Develop disciplinary knowledge:** Building on the 'working scientifically' aspects of the National Curriculum, we ensure that students experience real life scientific procedures and techniques. These applications are taught in conjunction with the substantive knowledge to ensure that skills are not taught in isolation of theoretical knowledge.
- **Subject specific vocabulary:** Reading is at the forefront of our curriculum. Students develop subject specific literacy in multiple ways. Students develop the scientific capability to able to analyse sources of data, make observations, provide detailed descriptions and to identify links in chemical formula.
- **Concrete examples and real life contexts:** Students practice application of knowledge in meaningful real life contexts. Multiple topics have distinct links to everyday life and teaching explicitly highlights these. Students develop a flexible knowledge which can be applied to unfamiliar scenarios both within the classroom and in their own lives.

Aims and outcomes

Through our carefully sequenced and ambitious curriculum our students will develop the **substantive (fundamental)** knowledge across Biology, Chemistry and Physics:

- **Biology:**

- An understanding of cell biology, from the basic structure of cells, to the importance of cellular respiration and the factors affecting enzyme function.
- That living organisms have transport systems which relate their structure to their functions through adaptations.
- How health and disease impacts on society, how medicines have been developed over time and how vaccinations reduce the risk of serious illness from disease.
- The principles of coordination and control from the structure and function of the nervous system to the varying levels of hormones involved in fertility.
- How photosynthesis and respiration can be measured, monitored and increased and the links between these 2 processes.
- The intricate balance of the components of ecosystems through the cycling of materials, the distribution and abundance of living organisms and the interactions of humans.
- Biology in the past and present. How variation and inheritance has led to evolution over time and how we can identify patterns in inheritance from parents but also from common ancestry using evolutionary trees.

- **Chemistry**:

- The atomic structure and the developing theories which lead to Mendeleev's periodic table and the Bohr atomic model.
- Knowledge of the different types of bonding and how properties are related to structures and bonding types.
- How key chemical reactions occur and how these can be used in industry, medicine, and daily lives.
- How chemical reactions allow energy changes and to interpret reaction profiles to explain this.
- That the rate of chemical change varies for different reasons and that analytical techniques are used to analyse the products of reactions.
- The composition of the Earth and our Atmosphere, how this is changing over time and out impact of the environment through recycling, the use of crude oil and extraction of raw materials from the Earth's crust.

- **Physics**:

- An understanding of energy stores, transfers and how energy can be sourced from renewable and non-renewable resources.
- Identification of forces acting upon objects, including their impact on motion, speed and direction.
- Knowledge of waves including key properties, their ability to transfer energy and their uses in a variety of situations.
- How atomic structure and particle theory relates to physical changes, pressure, motion and radioactivity.
- Application of knowledge of electrical circuits. How to measure various values and how each value is linked to others.
- Knowledge of magnetism and electromagnetism and their applications.
- Understanding of the magnitude of 'space'.

Aims and outcomes

Throughout the 5 year curriculum students will develop **scientific disciplinary knowledge and skills** to allow application of knowledge in different contexts.

- **The development of scientific thinking**: Students will learn how scientific methods and theories continuously develop over time and use models to develop scientific explanations. Our students use moral judgements to make informed ethical decisions and form arguments based on evidence. Students also evaluate risks in practical science and recognise the importance of peer review to reduce bias. Our curriculum allows engagement in respectful conversations around challenging topics and supports complex, informed decisions to be made.
- **Experimental skills and strategies**: Students understand a range of developing scientific theories and apply their knowledge in a range of techniques. They use a wide range of apparatus to make accurate measurements and comment on validity, reliability and reproducibility.
- **Analyse data:** Students should be able to analyse qualitative and quantitative data gathered or shared with them, using a wide range of mathematical techniques including graphs and tables. Students analyse trends in data and identify patterns and anomalous results. Students also to suggest improvements to methods.
- **Vocabulary, units, symbols, nomenclature:** Students will be able to use standardised units effectively and perform appropriate calculations**,** including standard conversions.
- **Continuously evolving:** Within the curriculum students will explore the changing nature of scientific theories, laws and models.
- **Impact of science:** Students will learn about local and global communities, the contribution of humans on the climate, resources and biodiversity, and what science's role is in the future. Students should be able to make informed decisions which impact themselves and their communities and to provide justification based on data or evidence.

Opportunities

All AQA science qualifications provide students with the opportunities to progress to A-levels in science or other subjects and a large range of different courses provided at our local further educational establishments. The AQA qualification will also provide opportunities for employment in our thriving region including the renewable industries on the Humber bank and engineering and training opportunities with local companies and partnerships including HETA and other Phillips 66 employers.

Year 7 overview

Year 7 students experience, some for the first time, teaching of biology, chemistry and physics fundamental concepts. Students learn the key ideas about chemical substances, classifying and separating these, what living things are made of and how forces and energy impact upon objects. A well developed understanding of these core ideas provides a strong starting point for students to progress towards more challenging concepts further in the key stage and beyond.		
Biology: Ecology and ecosystems Variation and inheritance Reproduction Organisation of organisms Cells and transport	Chemistry: Atoms, elements and compounds Particle theory The periodic table Separation techniques Acids and alkalis Neutralisation	Physics: Energy stores and transfers Power and efficiency Force and motion Friction and pressure

Year 8 overview

Year 8 students are taught more challenging ideas such as photosynthesis, respiration and electricity. These concepts require a deeper level of understanding and therefore an adequate level of understanding of cells and tissues, the names of gases in the atmosphere, energy types and transfer are required prior to experiencing these concepts.		
Biology: Gas exchange and breathing Risk factors on disease Digestion and health Enzymes and bacteria in digestion Aerobic and anaerobic respiration Photosynthesis Natural selection, diversity and extinction Genetics and inheritance	Chemistry: Atoms in chemical reactions Metal chemical reactions Combustion and energy changes in reactions Conservation of mass The structure of the earth and the impact of humans on the Earth's atmosphere and resources. The moon, the sun, the solar system and space	Physics: Wave properties and effects Light and sound waves Current, potential difference and resistance in series and parallel circuits. Magnetism and electromagnetism.

Year 9 overview

Year 9 students are taught in more detail, some of the concepts first introduced in year 7. We look deeper into topics such as chemical reactions, energy and extend disciplinary knowledge skills through more practical work and analysis. We aim to extend student's knowledge by prioritising experiences of ideas such as chemical bonding and communicable disease. This prepares a strong foundation for students to develop more detailed explanations in the next key stage.

Biology:	Chemistry:	Physics:
Organisation of organisms	Atoms, elements and compounds	Energy stores and transfers
Cells and transport	Particle theory	Heating and cooling
Variation and inheritance of characteristics	The periodic table	Power and efficiency
Variation within species	Separation techniques	Contact forces and resultant forces
Human reproduction and the menstrual cycle	Metal reactions	Friction and pressure
Communicable diseases and prevention	Energy changes in reactions	Light and sound wave properties and effects.
	Bond energies	
	Types of bonding	

Year 10 overview

The aim of year 10 units of work is to deepen and broaden understanding founded in ks3. Students either opt to follow the AQA combined trilogy GCSE or AQA separate science GCSE course. Both qualifications provide students with a diverse range of concepts and ideas from Biology, Chemistry and Physics and explore more deeply into some specifics such as enzyme function, energy transfers and efficiency and electrolysis. It is within year 10 that students fine tune their disciplinary knowledge within required practical elements of the AQA specification.

Biology:	Chemistry:	Physics:
Cell structure and transport	Structure of the atom, compounds and separating mixtures	Conservation and dissipation of energy
Cell division	The development of the periodic table	Energy transfers by heating
The digestive system and enzymes	Structure and bonding in metals and non-metals	Renewable and non-renewable energy resources
Organisation of animals and plants	Chemical calculations	Current, potential difference and resistance in circuits
Communicable diseases and prevention of non-communicable disease	Reactions of metals, acids and alkalis	Electricity in the home
Photosynthesis	Electrolysis	Particles and density
Respiration	Energy changes in reactions	Radioactivity of atoms
The human nervous system	Rates of reaction and equilibrium	Forces between objects
Hormonal control and homeostasis		

Year 11 overview

Year 11 students build on knowledge gained in previous years, or previous parts of their AQA specification. They explore in more depth the exciting processes of genetic inheritance, fractional distillation and reflection and evaluate the impact of ethical choices on our environment. Students also have opportunities to recap previous fundamental ideas and apply knowledge in multiple applications through practicing exam technique.		
Biology: Types of reproduction and inheritance Variation and evolution Genetics and evolution Adaptations, interdependence and competition Organisation of an ecosystem Biodiversity and ecosystems	Chemistry: Crude oil, hydrocarbons and cracking Chemical analysis The Earth's changing atmosphere The Earth's resources	Physics: Objects in motion Forces, acceleration and momentum The nature and properties of waves Electromagnetic waves Magnetism and electromagnetism