



Science

Curriculum Overview



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SUBMARINE
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Science

Our vision

The Science Department aims to provide its students with an engaging, challenging and aspiring curriculum. Science is all about finding out what our world and universe is really like and learning to understand it better. To do so we need to learn to make accurate observations and measurements. Investigations test our ideas, so we learn about living things, substances, forces and energy. We want our students to build on what they already know about the Natural World and to discover more. We all need to understand the impact which Science is having on our lives and how it can help shape our future.

Skills

We aim to provide activities within lessons to help foster our student's ability to problem solve, apply scientific reasoning to different situations, demonstrate and practice a range of analytical skills and represent data in a number of ways.

Knowledge

We believe we have assembled a rich and dynamic curriculum that explores the fundamentals of Science. We want our students to foster a love for all things Science and want them to be able to explain and understand how the world around them works. To help us deliver this we have made sure that we have a broad curriculum touching all aspects of Science during Key Stage 3 and not solely focus on topics they will meet again during their GCSE course. Our curriculum is divided into the 10 big ideas, Forces, Electromagnets, Energy, Waves, Matter, Reactions, Earth, Organisms, Ecosystems and Genes. Over the 5 years of studying Science, students will meet these big ideas at every Key stage, building upon the solid foundation they would have learnt from previous years, preparing them for their next stage of scientific learning.

Enrichment

The Science Department provides a varied extra-curricular programme of events. This ranges from lunchtime revision sessions helping students to develop exam skills and knowledge, TeenTech project, Key stage 3 Science club and participating in research-based projects for the Institute of Research in Schools. Currently these projects involve looking at natural remedies to cure bacterial diseases and the James Web Telescope. During Science Week, Sixth form Science ambassadors provide workshops for local primary schools.

Science - Year 7

In Years 7 students study a range of units encompassing the 10 Big ideas. The course delivers on engagement, understanding and skills. Additionally, it aims to motivate students to learn, whatever the topic.

Students will become confident with “Working Scientifically” skills in preparation for their GCSEs whilst at the same time learning about contemporary and relevant scientific issues. The course also best prepares the students for the ‘new’ GCSE course which expects students aiming for the top GCSE grades to be able to apply the knowledge gained in lessons to new situations.

Every two terms students will study a unit from each of the Sciences.

Biology:

Organisms- Students will explore how the skeletal system and muscular system work together to cause movement. They will also understand the organisation of multicellular organisms.

Ecosystems-Students will investigate the impact of changes in a population of one organism on others in an ecosystem and will understand how plants reproduce.

Genes- Students will study why there is variation between different species and how it may lead to the survival of a species. They will also explore how a foetus develops.

Chemistry:

Matter- Students will explore the features of the particle model and relate them to the properties of different materials. Students will also investigate how to separate mixtures based on their properties.

Reactions- Students will be able to use experimental data to compare metals and non-metals. They will also be able to use their knowledge of acids and alkalis to compare how well indigestion remedies work.

Physics:

Forces- Students will investigate forces and the affect they have on the speed of a car down a slope. They will also explore why an astronaut’s weight varies on a journey through space.

Earth (Universe) - Students will take a journey through our Solar system and the Universe.

Electromagnets- Students will investigate electrical circuits understanding how they work.

Energy- Students will look at how energy can be transferred from one object to another and be able to compare energy sources used to generate electricity.

Waves- Students will explore how sound waves change in pitch and volume. They will also study how light passes through lenses and transparent materials.

Science - Year 8

In Years 8 students study a range of units encompassing the 10 Big ideas, as they did in Year 7. The course continues to deliver on engagement, understanding and skills, while motivating students to learn, whatever the topic.

Students will become confident with “Working Scientifically” skills in preparation for their GCSEs whilst at the same time learning about contemporary and relevant scientific issues. The course also best prepares the students for the ‘new’ GCSE course which expects students aiming for the top GCSE grades to be able to apply the knowledge gained in lessons to new situations.

Every two terms students will study a unit from each of the Sciences.

Biology:

Organisms- Students will explore the respiratory system and the digestive system of the human body.

Ecosystems-Students will study the process by which mammals obtain energy and how plants carry out photosynthesis to produce their own food source.

Genes- Students will study the evidence for evolution and will investigate how species can become extinct. Students will also look at how traits are inherited.

Chemistry:

Matter- Students will sort elements using chemical data and relate this to their position on the periodic table. They will also be able to compare elements and compound properties.

Reactions- Students will investigate everyday items that use exothermic and endothermic reactions. They will also compare types of reactions.

Earth- Students will explore the structure of the Earth and understand how rocks are formed. They will also investigate the contribution that natural and human chemical processes make to our Carbon Dioxide Emissions. Students will also understand how extract and use the Earth’s natural resources.

Physics:

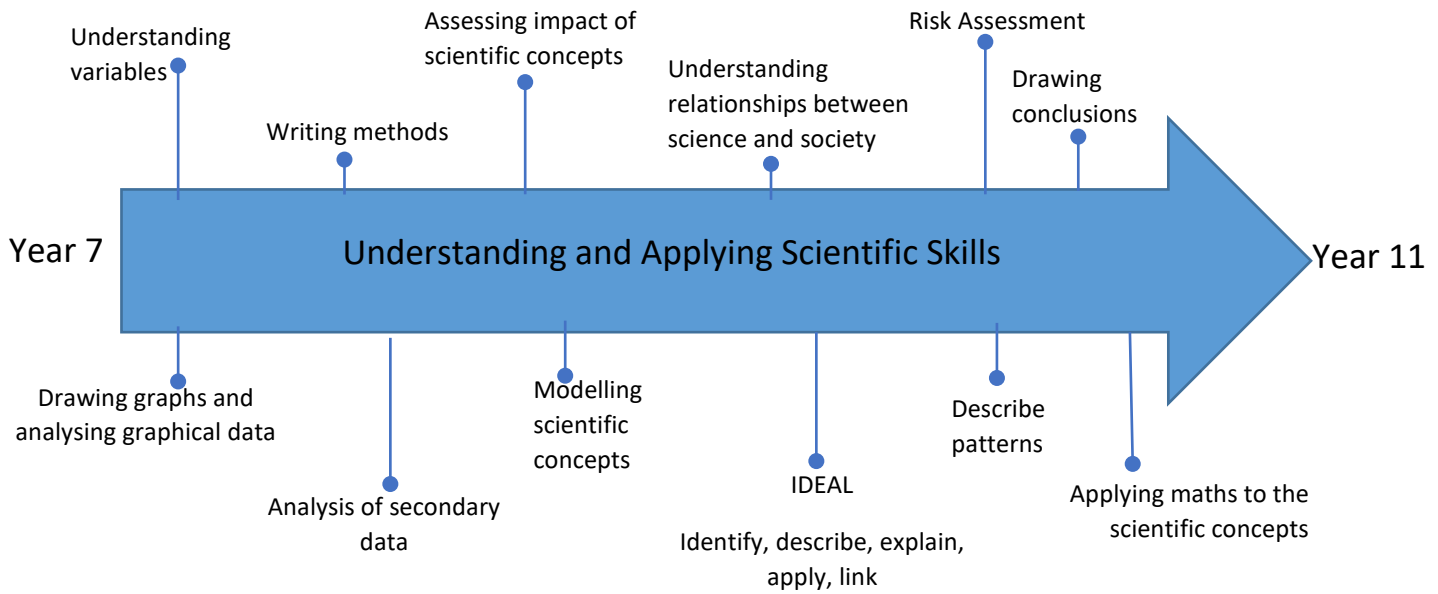
Forces- Students will investigate factors that affect the size of frictional forces as well as how the pressure from your foot onto the ground varies with different footwear.

Electromagnets- Students will investigate ways to vary the strength of an electromagnet and explore the magnetic field pattern around different types of magnets.

Energy- Students will investigate how work is done when using forces to move an object. They will also investigate how to prevent heat loss by conduction, convection and radiation.

Waves- Students will explore the impact of different types of waves on living cells and use wave models to explain the observations of reflection, absorption and transmission of waves.

Curriculum Overview- Key stage 3



	Term	Biology	Chemistry	Physics
Year 7	1 and 2	Introduction- How Science Works		
		Organisms- Movement and Cells	Matter Part 1- Particles	Forces- Speed and Gravity
	3 and 4	Ecosystems- Interdependence and Plant reproduction	Matter Part 2- Separating mixtures	Waves- Sound and Light
				Earth 2- Universe
	5 and 6	Genes- Reproduction and Variation	Reactions- Metals and non-metals and Acids and Alkalis	Electromagnets- Current and Voltage
Energy- Energy costs and Energy transfers				
Year 8	1 and 2	Organisms- Breathing and Digestion	Matter- Periodic Table and Elements	Waves- Wave effects and Wave properties
				Forces- Contact forces and Pressure
	3 and 4	Ecosystems- Respiration and Photosynthesis	Earth 1- Rocks	Energy- Work and Heating and cooling
			Reactions- Chemical energy and Types of reactions	
	5 and 6	Genes- Evolution and Inheritance	Earth 3- Climate and Earth Resources	Electromagnets- Magnetism and Electromagnetism
Independent investigation project				

Science - Year 9

During this year, all students will study Science. At the end of the year students will complete an assessment, which will allow us to recommend a suitable GCSE Science course for them to continue on. This will either be Combined Science or the Separate Sciences

Through year 9 students will cover the following topics:

Biology (studied over 3 hours a fortnight):

B1: Cells- Students will explore how structural differences between types of cells enables them to perform specific functions within an organism.

B2: Photosynthesis- Students will explore in greater depth how a plant harnesses the Sun's energy in photosynthesis in order to make food.

B3: Moving and transporting materials. Students will continue to learn about the human digestive system and the respiratory system as well as learning about the circulatory system. They will also study how a plant's transport system depends on environmental conditions.

Chemistry (studied over 3 hours a fortnight):

C1: Atomic Structure- Students will explore the historical development of the periodic table and how models of atomic structure provide good examples of how scientific ideas and explanations have developed over time.

C2: Structure and Bonding- Students will use theories of structure and bonding to explain the physical and chemical properties of materials.

C4: Chemical Changes- Students will study different chemical reactions to predict what substances will be formed.

Physics (studied over 2 hours a fortnight):

P1: Energy- Students will delve deeper into their understanding of energy stores and transfers.

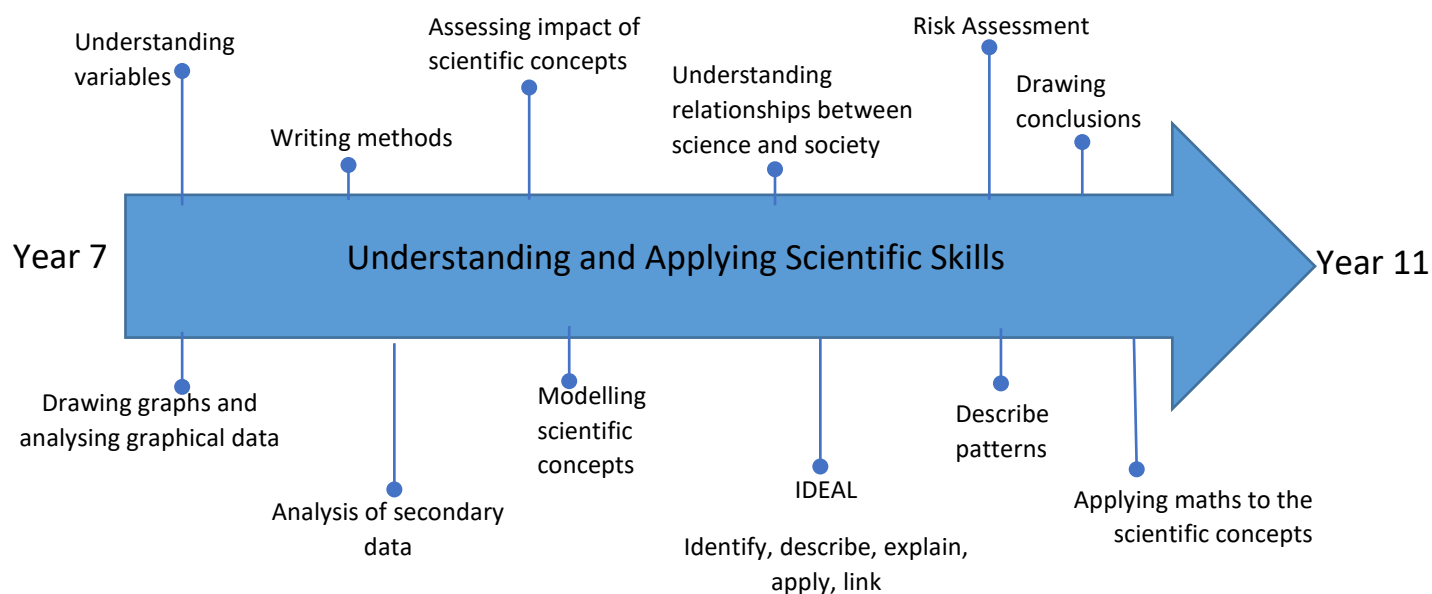
P2: Electricity- Students will continue to learn about electrical circuits, investigate more into current, potential difference and resistance.

During each topic students will become confident with "Working Scientifically" skills, and will undertake required practicals. The concept of these practicals will be assessed during their GCSE written examinations in year 11.

The following required practicals will be undertaken throughout the year:

- Use a light microscope to observe, draw and label cells
- The effect of salt or sugar on plant tissues
- Food tests
- The effect of pH on the rate of an enzyme controlled reaction
- The effect of light on the rate of photosynthesis
- Preparation of a pure, dry sample of a salt
- Electrolysis
- Calculating specific heat capacity using energy changes
- Investigate the effectiveness of different materials as thermal insulators
- Investigating the effect of resistance of an electrical circuit
- IV characteristics of a filament, diode and resistor

Curriculum Overview- Year 9



Term	Biology	Chemistry	Physics
1 and 2	B1: Cells	C1: Atomic Structure	P1: Energy
3 and 4	B2: Photosynthesis	C2: Structure and Bonding	P1: Energy continued P2: Electricity
5 and 6	B3: Moving and transporting materials	C4: Chemical Changes	

Science- Year 10

Some students in year 10 will now study the GCSE Combined Science Course having been taught the foundations in year 9. They will study a combination of topics from Biology, Chemistry and Physics. These topics include:

Biology (studied over 3 hours a fortnight):

B4- Health Matters- Students will explore how diseases can make us ill and how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens.

B6- Genetics- Students will be able to explain inheritance through the combination of new genes via sexual reproduction to produce a unique offspring.

B8- Ecology- Students will investigate how humans are threatening the biodiversity as well as natural systems the environment supports.

Chemistry (studied over 3 hours a fortnight):

C3- Quantitative Chemistry will allow students to explore the world of quantitative analysis to determine the formulae of compounds and the equations for reactions.

C5- Energy Changes- Students will explore the interaction of particles involved in transfer of energy due to the breaking and formation of bonds during a chemical reaction.

C6- Rates of Reaction- Students will investigate how the speed of a chemical reaction can be increased and how we can use this knowledge in industry.

C10- Sustainable Development- Students will look at how pollution, disposal of waste and changing land use has significant effect on the environment and how we can minimise these effects.

Physics (studied over 3 hours a fortnight):

P3- Particle model of matter- Students will use the particle model to predict the behaviour of solids, liquids and gases and apply this to different applications of everyday life.

P4- Atomic structure- Students will discover why some elements are radioactive and will look at the different types of ionising radiation.

P5- Forces- Students will be on their knowledge of forces to explain their interactions and how they will effect motion.

During each topic students will continue to develop their “Working Scientifically” skills by undertaking practical work including required practicals. The concept of these practicals will be assessed during the GCSE examinations in year 11.

The following required practicals will be undertaken throughout the year:

- Measuring population size of a common species in a habitat
- Determine the densities of regular and irregular solid objects and liquids
- Investigate the relationship between force and the extension of a spring
- Investigating the acceleration of an object
- The effect of concentration on the rate of reaction
- Investigate the variables that will affect temperature changes in reacting solutions

Separate Science students in year 10 will continue to study the AQA GCSE Separate Science they embarked on in year 9. They will cover the following topics in their Separate Sciences lessons:

Biology (studied over 3 hours a fortnight):

B4- Health Matters- Students will explore how diseases can make us ill and how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens.

B6- Genetics- Students will be able to explain inheritance through the combination of new genes via sexual reproduction to produce a unique offspring.

B8- Ecology- Students will investigate how humans are threatening the biodiversity as well as natural systems the environment supports.

Chemistry (studied over 3 hours a fortnight):

C3- Quantitative Chemistry will allow students to explore the world of quantitative analysis to determine the formulae of compounds and the equations for reactions.

C5- Energy Changes-Students will explore the interaction of particles involved in transfer of energy due to the breaking and formation of bonds during a chemical reaction.

C6- Rates of Reaction- Students will investigate how the speed of a chemical reaction can be increased and how we can use this knowledge in industry.

C10- Sustainable Development- Students will look at how pollution, disposal of waste and changing land use has significant effect on the environment and how we can minimise these effects.

Physics (studied over 3 hours a fortnight):

P3- Particle model of matter- Students will use the particle model to predict the behaviour of solids, liquids and gases and apply this to different applications of everyday life

P4- Atomic structure- Students will discover why some elements are radioactive and will look at the different types of ionising radiation.

P5- Forces- Students will be on their knowledge of forces to explain their interactions and how they will effect motion

P6a- Waves- Students will investigate the properties of transverse and longitudinal waves.

During each topics students will continue to develop their “Working Scientifically” skills by undertaking practical work including required practicals. The concept of these practicals will be assessed during the GCSE examinations in year 11.

The following required practicals will be undertaken throughout the year:

- Measuring population size of a common species in a habitat
- Determine the densities of regular and irregular solid objects and liquids
- Investigate the relationship between force and the extension of a spring
- Investigating the acceleration of an object
- The effect of concentration on the rate of reaction
- Investigate the variables that will affect temperature changes in reacting solutions
- Measuring the wavelength, frequency and speed of waves in a ripple tank and waves in a solid

Science - Year 11

Combined Science students will continue on the AQA Combined Science Trilogy Course they embarked on in year 9 and 10. They will study a combination of topics from Biology, Chemistry and Physics. These topics include:

Biology (studied over 4 hours a fortnight):

B5- Coordination and control- Students explore the structure and function of the nervous system and how it can bring about responses to the environment around you. They will also study the hormonal system of the human body.

B7- Variation and evolution- Students will look at how scientists can use our knowledge of inheritance to carry out genetic engineering and selective breeding.

Chemistry (studied over 4 hours a fortnight):

C7- Hydrocarbons- Students will get to investigate the chemistry of carbon compounds and the uses of them.

C8- Chemical analysis -Students will investigate a range of qualitative tests to detect specific chemicals.

C9- Chemistry of the Atmosphere- Students will explore how the atmosphere has changed and the problems caused by increasing air pollution.

Physics (studied over 4 hours a fortnight):

P6- Waves- Students will investigate the properties of transverse and longitudinal waves as well looking at the electromagnetic spectrum.

P7- Electromagnetism – Students will get to grips with Fleming's left hand rule to explain electromagnetism.

During each topic students will continue to develop their "Working Scientifically" skills by undertaking practical work including required practicals. The concept of these practicals will be assessed during the GCSE examinations in year 11.

The following required practicals will be undertaken throughout the year:

- Investigating reaction times
- Investigate how the amount of infrared radiation absorbed or emitted depends on the nature of that surface
- Measuring the wavelength, frequency and speed of waves in a ripple tank and waves in a solid
- Paper Chromatography
- Analysis and purification of a water sample

Separate Science students in year 11 will continue to study the AQA GCSE Separate Science route they embarked on in year 9 and 10. They will cover the following topics in their Separate Sciences lessons:

Biology (studied over 4 hours a fortnight):

B5- Coordination and control Students explore the structure and function of the nervous system and how it can bring about responses to the environment around you. They will also study the hormonal system of the human body.

B7- Variation and evolution -Students will look at how scientists can use our knowledge of inheritance to carry out genetic engineering and selective breeding.

Chemistry (studied over 4 hours a fortnight):

C7- Hydrocarbons- Students will get to investigate the chemistry of carbon compounds and the uses of them.

C8- Chemical analysis- Students will investigate a range of qualitative tests to detect specific chemicals.

C9- Chemistry of the Atmosphere- Students will explore how the atmosphere has changed and the problems caused by increasing air pollution.

Physics (studied over 4 hours a fortnight):

P6b-Waves- Students will extend their knowledge of waves by looking at the electromagnetic spectrum.

P7- Electromagnetism Students will get to grips with Fleming's left hand rule to explain electromagnetism.

P8- Space – Students will explore the wonders of the universe and will look at the future of the Universe.

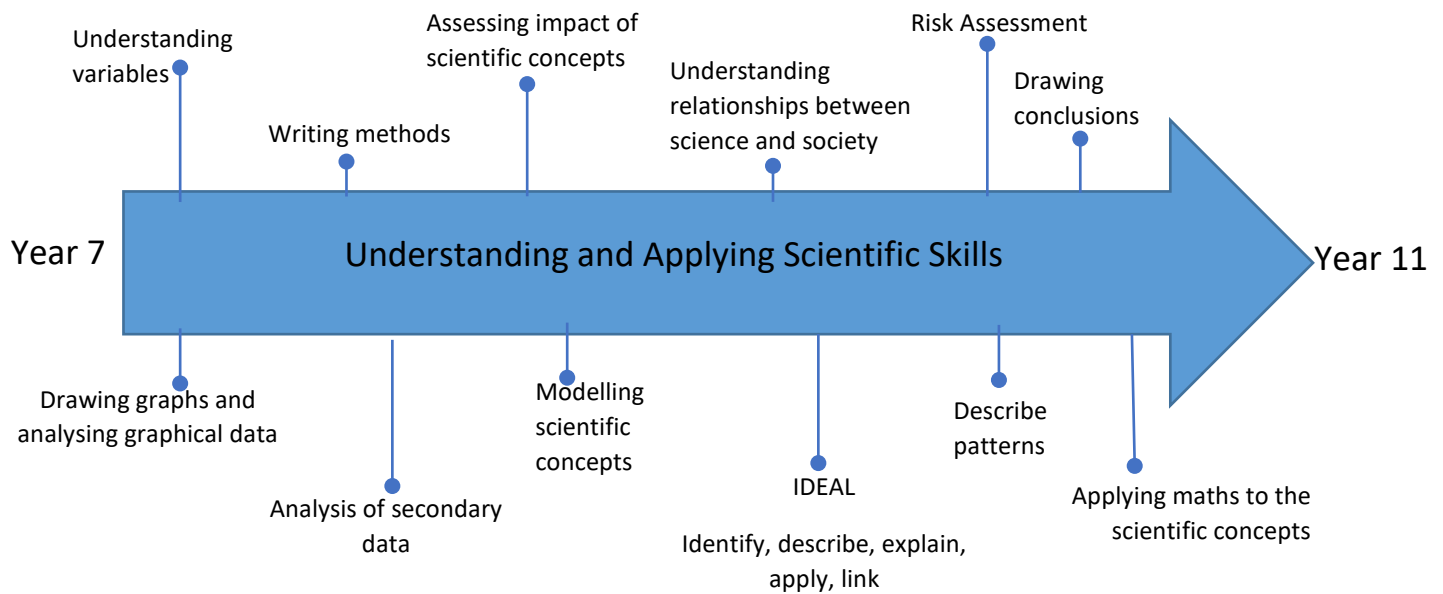
During each topic students will continue to develop their “Working Scientifically” skills by undertaking practical work including required practicals. The concept of these practicals will be assessed during the GCSE examinations in year 11.

The following required practicals will be undertaken throughout the year:

- Investigating reaction times
- The effect of light and gravity on growth of germinating seedlings
- Investigate how the amount of infrared radiation absorbed or emitted depends on the nature of that surface
- Investigate the reflection of light by different type of surface and the refraction of light by different substances
- Paper Chromatography
- Use chemical tests to identify the ions in unknown single ionic compounds
- Analysis and purification of a water sample

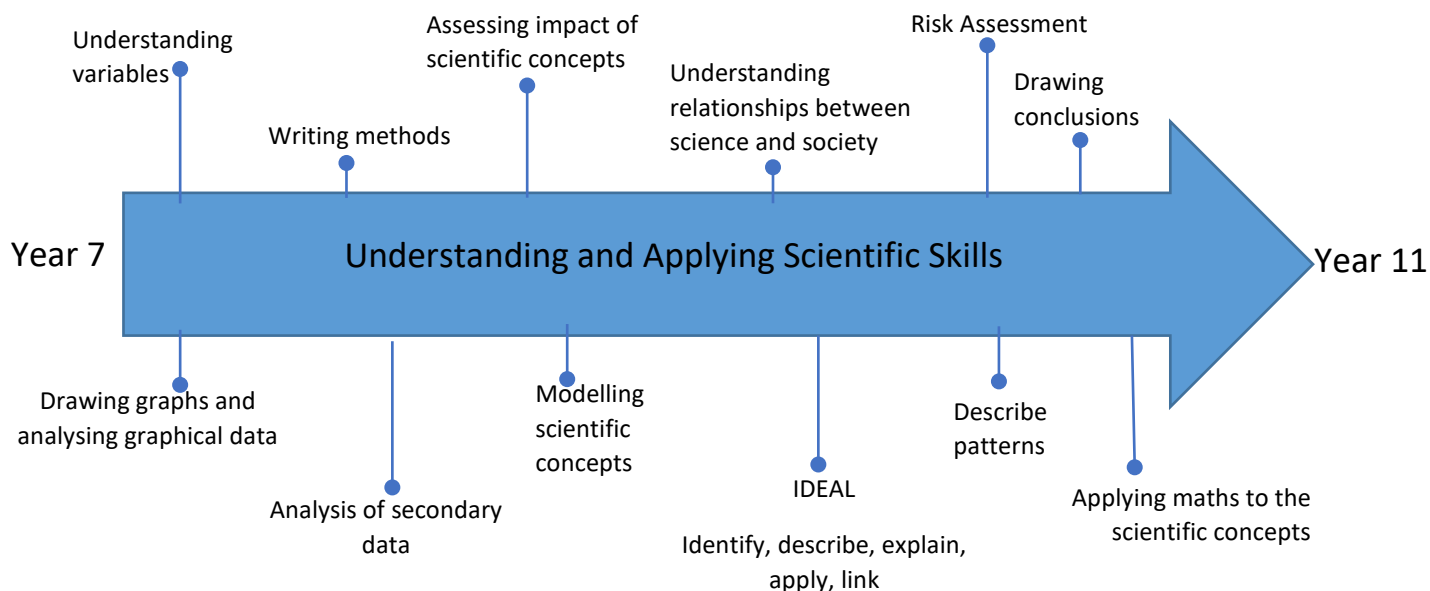
From the start of year 11, we run a fortnightly intervention programme for students based on previous topics taught in year 9 and 10. Students are given recall examination questions on a different topic each week, those who have struggled with them will be asked to attend a lunchtime intervention session the following week, with a specialist teacher to review that topic again. Students will be issued with the intervention timetable in September, which will provide helpful links to revision websites to aid them with the completion of the examination questions.

Curriculum Overview- Year 10 and 11 Combined Science



	Term	Biology	Chemistry	Physics
Year 10	1 and 2	B4- Health Matters	C3-Quantitative Chemistry	P3- Particle model of matter
	3 and 4	B6- Genetics.	C5- Energy Changes C6- Rates of Reaction	P4- Atomic structure
	5 and 6	B8- Ecology	C6- Rates of Reaction continued C10- Sustainable Development	P5- Forces
Year 11	1 and 2	B7- Variation and evolution	C7- Hydrocarbons- C8- Chemical analysis	P6- Waves
	3 and 4	B5- Coordination and control Revision	C9- Chemistry of the Atmosphere Revision	P7- Electromagnetism Revision
	5 and 6	Revision	Revision	Revision

Curriculum Overview- Year 10 and 11 Separate Science



	Term	Biology	Chemistry	Physics
Year 10	1 and 2	B4- Health Matters	C3-Quantitative Chemistry	P3- Particle model of matter P4- Atomic structure
	3 and 4	B6- Genetics.	C5- Energy Changes C6- Rates of Reaction	P5- Forces
	5 and 6	B8- Ecology	C6- Rates of Reaction continued C10- Sustainable Development	P6a- Waves
Year 11	1 and 2	B7- Variation and evolution B5- Coordination and control	C7- Hydrocarbons	P6b-Waves P7- Electromagnetism
	3 and 4	B5- Coordination and control continued Revision	C8- Chemical analysis C9- Chemistry of the Atmosphere Revision	P8-Space Revision
	5 and 6	Revision	Revision	Revision