

Science

Intent:

At the Marches School we aim to embrace the natural curiosity of our pupils, through an innovative and inspiring science curriculum. We encourage students to ask questions and think critically to develop a deep understanding of scientific concepts.

Context:

There are 10 'big ideas' in Science that make up and explain everything in the world around us:

- Forces
- Electromagnets
- Energy
- Waves
- Matter
- Reactions
- Earth
- Organisms
- Ecosystems
- Genes

The Big Picture—Intent:

This year will be a combination of grounding pupils in the key concepts that underpin the three sciences and ensuring they have a firm grasp of these to then extend them into Year 8 along with developing their practical and investigative skills. Furthermore, their data handling, application and literacy skills will be developed and assessed throughout.

Content / Units	Skills	Knowledge	Prior—Y6	Next—Y8
6 topics taught over the year, themed topics covering all of the 10 Big ideas for Science.	Practical skills topics to build on scientific skills, links to numeracy and literacy.	Unit 1: Not all scientists wear white coats – introduces safety in the lab and covers practical skills whilst learning about electricity and acids and alkalis. Unit 2: 999 – looks at the fire triangle, types of energy, body systems and healthy lifestyles). Unit 3: Titanic – pupils rediscover the particle model for solids, liquids and gases and then move onto forces and density. Unit 4: Shipwrecked – pupils learn about healthy diets and deficiency diseases, dissolving and separating mixtures and properties of different materials. Unit 5: Earth in Danger – students learn about renewable and nonrenewable energy sources, global warming and then adaptations in animals and food chains. Unit 6: Leaving Earth – the year ends with students learning about days, years and seasons and space whilst developing their calculations of speed.	KS2 topics that feed into year 7: Electricity Acids and alkalis Circulatory Healthy lifestyles Solids, liquids and gases Forces Materials Food chains Days, years and seasons Space	In year 8 students will continue with the thematic style topics done in year 7, continuing to cover content on from the 10 big ideas.

Implementation	Marches Futures Links	Summative Assessment
<p>The units are structured thematically to ensure students can holistically experience science and make connections between the three disciplines rather than being taught separately. The theme of each unit then has a narrative to help contextualize topics. Lessons are a combination of content-delivery with opportunities for learners to consolidate and then apply their knowledge to new situations as well as explore new topics through practical investigations.</p> <p>At times in each unit, pupils are expected to research new information or apply their knowledge and work independently in this. Homework is all set on Educake. Revision homework will be set once per unit and guidance will be provided on how to do this as well in-class revision which will be more structured and model good revision technique.</p> <p>WOW moments are interspersed throughout the course e.g. heart dissections, acids and alkalis, building their own rafts, shelters and rockets, learning about weird and wonderful adaptations of animals. Achievements will be celebrated at both a class level with teacher praise and also across the department.</p> <p>Year 7 Science is taught across 6 lessons per fortnight.</p>	<p>Science week is the second week in March and lessons during this week have a focus on STEM careers and further education links.</p> <p>SMSC is covered in each topic (see schemes) links made to relationships and sex during Unit 2 – 999.</p> <p>Links to careers are made at the start of each topic</p>	<p>All units include:</p> <ul style="list-style-type: none"> • Online end of unit quizzes. • End of term exams

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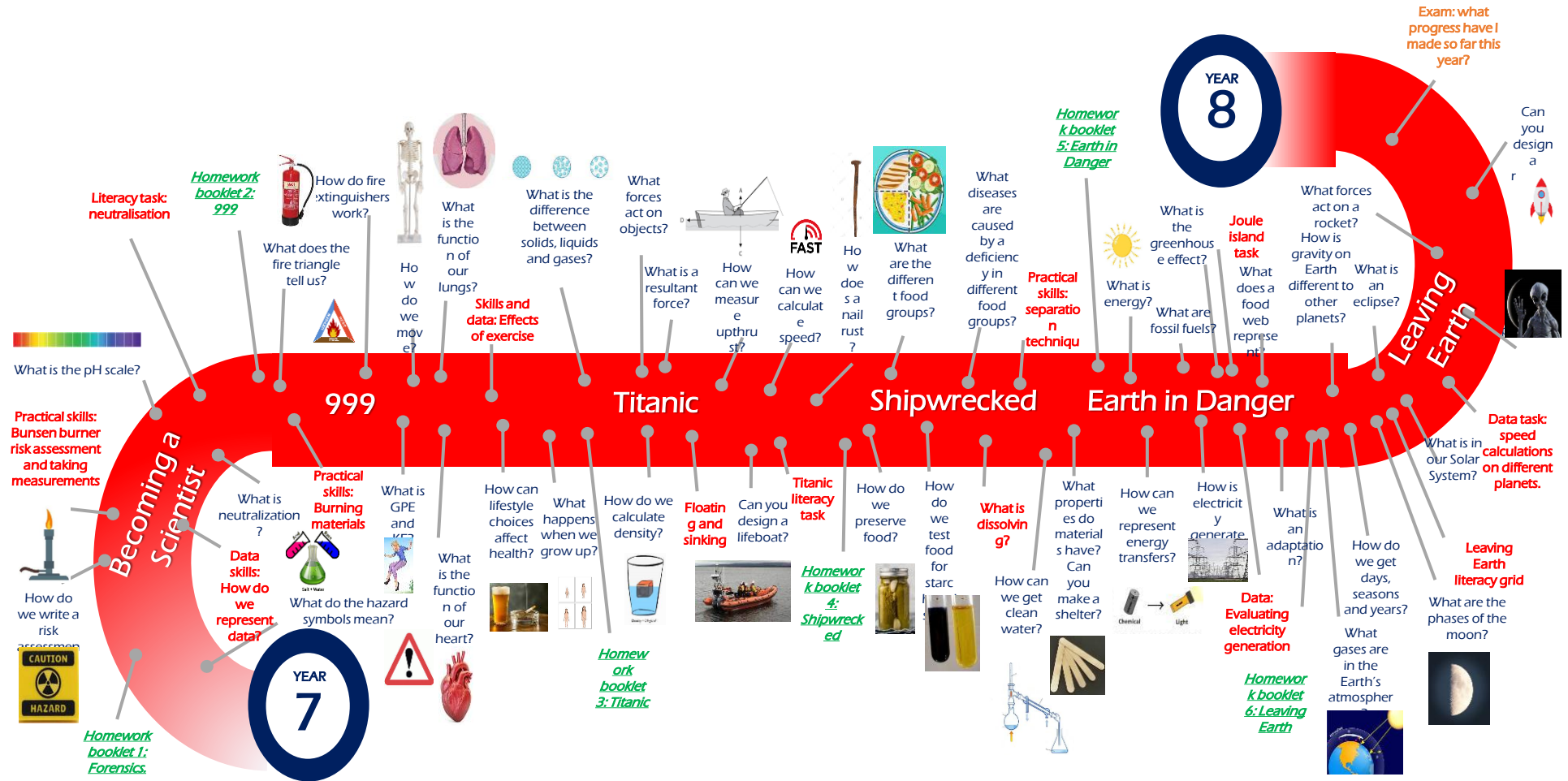
We want to pupils to feel they are real scientists by the end of Year 7; competent and comfortable in their practical skills e.g. handling glassware, using lab equipment, making accurate observations as well as having a sound understanding of some of the key concepts across the sciences: forces, particle models, chemical reactions, body systems, animals within habitats and space. We need them to be able to take a piece of knowledge and not just see this as a fact but understand it and be able to apply it to unknown situations. As they head into Year 8 they will develop both their knowledge and skills in all of these areas build upon these key concepts to help prepare for the step up to GCSE in Year 9. We don't want them to see science as Biology, Chemistry and Physics but rather as a subject that explains the phenomena, they see in the world around them encouraging them to want to find out more.

What will you be learning in Year 7 Science?



The topics you will study in Year 7 build on your **knowledge** and **understanding** of topics you were introduced to in Primary School, as well as new content to provide the foundations and principles for further study in science.

This foundation of knowledge, as well as the **practical skills learnt**, will equip you well to go on and study the broad range of topics on offer in future years. The skills you learn in each topic will prepare you for GCSE as well as to be curious, innovative, and independent scientists!



YEAR 7 CURRICULUM

Becoming a scientist	<p>ES1 Identify and describe the hazard symbols</p> <p>ES2 Write a risk assessment for using a Bunsen Burner</p> <p>ES3 Use scientific equipment to measure volume</p> <p>ES4 Know the 3 variables</p> <p>ES5 Write a scientific method</p> <p>ES6 Display data in an appropriate table and graph</p> <p>ES7 Define acid, alkali, base, neutralisation reactions</p> <p>ES8 Know the difference between concentrated and dilute solutions</p> <p>ES9 Identify the colour changes with litmus, universal indicator solution and universal indicator paper</p> <p>ES10 Know what neutralisation is and describe some useful neutralisation reactions</p>	<p>GD1 Explain what combustion is happening with roaring flame and safety flame</p> <p>GD2 Differentiate between accuracy and precision</p> <p>GD3 Know what type of graph will be used based on the data</p> <p>GD4 Evaluate use of litmus paper and universal indicator</p> <p>GD5 Write a word equation for a neutralisation reaction</p>
999	<p>ES1 Know the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms</p> <p>ES2 Know the basic structure and function of the gas exchange system in humans</p> <p>ES3 Describe some of the changes that take place inside the chest cavity when you inhale and exhale</p> <p>ES4 Know the structure on functions of the human skeleton</p> <p>ES5 Know what a healthy diet is</p> <p>ES6 Know that drugs are chemical substances that affect the way the body works</p> <p>ES7 Know the effects of smoking and alcohol</p> <p>ES8 List types of energy</p> <p>ES9 Draw an energy transfer diagram</p> <p>ES10 Calculate kinetic energy and gravitational potential energy</p>	<p>GD1 Consider dietary requirements of someone with a specific dietary need</p> <p>GD2 Give examples of stimulants and depressants</p> <p>GD3 Rearrange energy equations</p> <p>GD4 Convert units from J to KJ</p>
Titanic	<p>ES1 Know the particle arrangement, separation, and movement in different states</p> <p>ES2 Draw particle model diagrams</p> <p>ES3 Know what melting and boiling points are in relation to changes of state</p> <p>ES4 Know what density is and how the arrangement of particles affects density</p> <p>ES5 Know the types of forces</p> <p>ES6 Know the effects of forces on shape and motion</p> <p>ES7 Know the effects of non-contact forces such as magnetic, gravitational and electric fields</p> <p>ES8 I can design a lifeboat using my knowledge of forces</p> <p>ES9 Calculate speed</p> <p>ES10 Know what diffusion is</p>	<p>GD1 Convert units from cm³ to m³</p> <p>GD2 Explain the difference between mass and weight</p> <p>GD3 Rearrange speed equation</p> <p>GD4 Explain the effects of temperature, conc. gradient and surface area on the rate of diffusion, linked to particle model</p> <p>GD5 Predict what will happen to the motion of an object when forces are balanced or unbalanced</p> <p>GD6 Describe what terminal velocity is</p>

YEAR 7 CURRICULUM

<p>Shipwrecked</p>	<p>ES1 To know what a healthy diet is ES2 Describe the effects of having an unhealthy diet ES3 Describe what each food group is needed for ES4 Describe the different food tests ES5 Know what pure, mixture, solute, solvent, solution, dissolve and solubility mean ES6 Know that solubility changes with temperature ES7 Know how filtration works and some uses of filtration ES8 Know how evaporation can be used to separate a substance form a solution ES9 How distillation is used to separate a solvent from a solution ES10 How to use chromatography to separate the substance in a mixture ES11 Describe the process of digestion</p>	<p>GD1 Consider the impact that diet has on immune system GD2 Explain the method of the food tests GD3 Predict the results of food tests on different food samples GD4 Calculating the Rf value GD5 Describe and explain the function of bile within digestion GD6 Evaluate how well a model represents key features of the digestive system</p>
<p>Earth in Danger</p>	<p>ES1 Know the energy resources ES2 Explain what conservation of energy is ES3 Draw energy transfer diagrams ES4 Know energy stores and transfers ES5 Describe the difference between renewable and non-renewable ES6 Name the 3 fossil fuels ES7 Name the 3 greenhouse gases ES8 Describe the cause and impact of the greenhouse effect ES9 Describe the cause and impact of climate change ES10 Describe the cause and impact of global warming</p>	<p>GD1 Evaluate the use of nuclear power to generate electricity GD2 Describe the role of the turbine and generator in power stations GD3 How carbon moves between carbon stores in the carbon cycle GD4 Describe why the amount of carbon dioxide in the atmosphere has changed GD5 Know the composition of the earth and the atmosphere</p>
<p>Leaving Earth</p>	<p>ES1 Know the different types of forces ES2 Know the effects of non-contact forces such as magnetic, gravitational and electric fields ES3 Know what the solar system is and about its formation ES4 Know the composition of the earth and the atmosphere ES5 Label the forces acting on a rocket ES6 Design a rocket using scientific knowledge ES7 Describe what natural and man-made satellites are</p>	<p>GD1 Explain what g-force is GD2 Explain the cause of days, months and seasons using knowledge of space and rotations GD3 Draw conclusions about temperature of different planets GD4 Consider the use of different fuels in a rocket</p>

The Big Picture—Intent:

This year will be a continued combination of grounding pupils in the key concepts that underpin the three sciences extend them based on their Y7 work, continuing to developing their practical and investigative skills, also their data handling, application and literacy skills will be developed and assessed throughout.

Content / Units	Skills	Knowledge	Prior—Y7	Next—Y9
6 topics taught over the year, themed topics covering all of the 10 Big ideas for Science.	Practical skills topics to build on scientific skills, links to numeracy and literacy.	Unit 1 - MasterChef – Digestion, microbes and conduction of heat. Unit 2 - Fireworks - Making, seeing & hearing fireworks. Unit 3 - Down on the Farm - cells, inheritance, genetics and evolution. Unit 4 - Materials and Recycling - Material properties and reactions. Unit 5 - Going for Gold - Joints, respiration and the effect of drugs. Unit 6 - Top Gear - Forces and motion.	Year 7 topics all cover the similar thematic style topics as year 8 and prepare students for deeper thinking and understanding of the 10 big ideas of Science.	In year 8 students will use their knowledge of the 10 big ideas and begin to apply them to the GCSE specification. Practical skills is developed further in year 9.

Implementation	Marches Futures Links	Summative Assessment
<p>The units are structured thematically as in Y7 to ensure students can holistically experience science and make connections between the three disciplines rather than being taught separately. The theme of each unit then has a narrative to help contextualize topics. Lessons are a combination of content-delivery with opportunities for learners to consolidate and then apply their knowledge to new situations as well as explore new topics through practical investigations. This is where pupil's LORIC skills will be really developed and reflected upon.</p> <p>At times in each unit, pupils are expected to research new information or apply their knowledge and work independently in this. Homework is all set on Educake. Revision homework will be set once per unit and guidance will be provided on how to do this as well in-class revision which will be more structured and model good revision technique.</p> <p>WOW moments are interspersed throughout the course e.g. model digestive systems, making sparklers, growing micro biotic cultures, remote controlled car racing. There are many opportunities to develop numeracy skills across most of the units and these are assessed and developed through data assessments and feedback. Graphs in particular remain a focus along with the development of skills with equations. For each unit students are provided with a key word list and their literacy skills are assessed throughout the year along with a lot of practice of answering application-style questions to ensure we are preparing them for command words at GCSE.</p> <p>Year 7 Science is taught across 6 lessons per fortnight.</p>	<p>Science week is the second week in March and lessons during this week have a focus on STEM careers and further education links.</p> <p>SMSC is covered in each topic (see schemes) links made to relationships and sex during Unit 3 – Down on the Farm.</p> <p>Links to careers are made at the start of each topic</p>	<p>All units include:</p> <ul style="list-style-type: none"> • Online end of unit quizzes. • End of term exams

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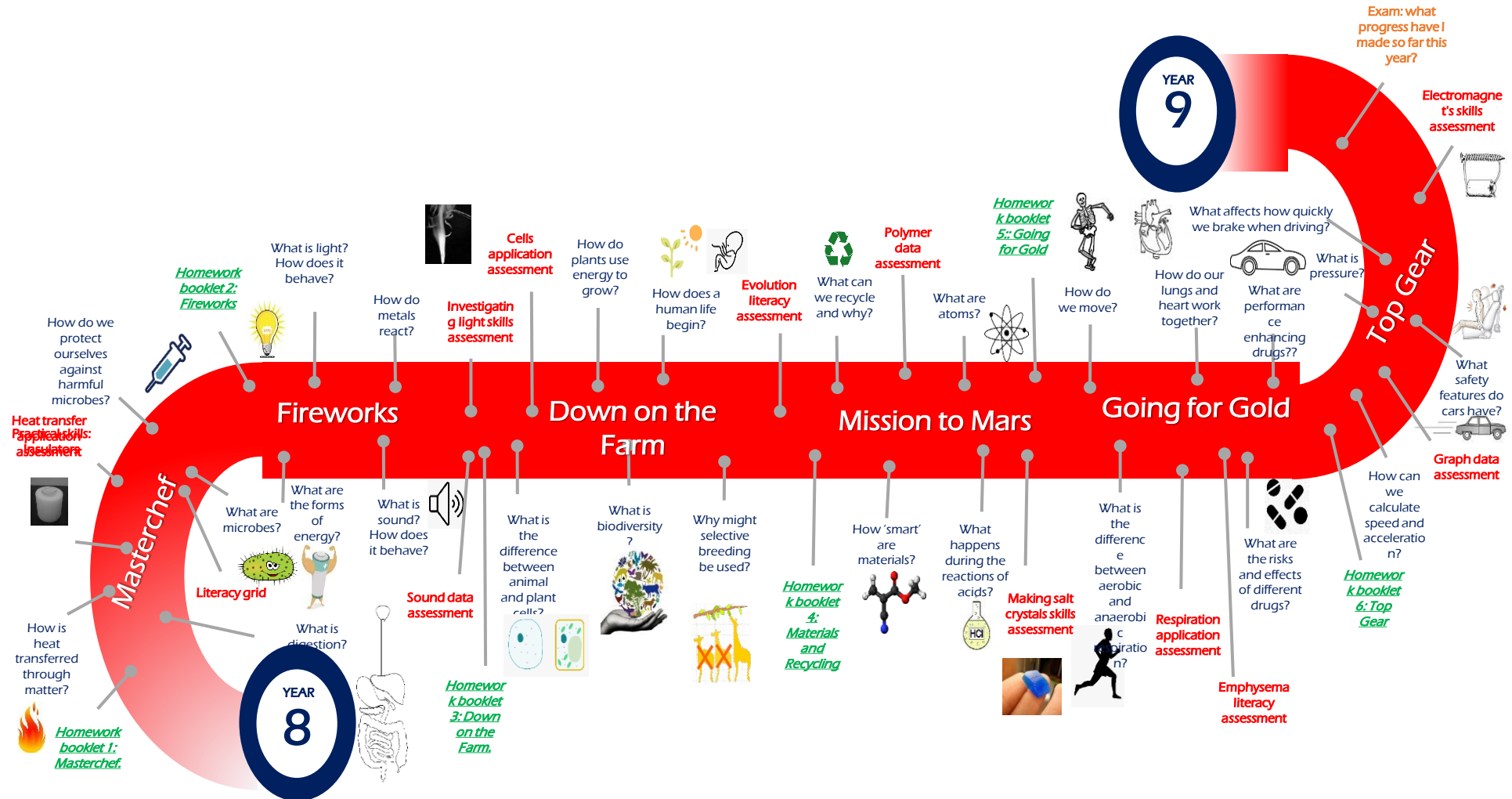
We want to pupils to feel they continue to be real scientists by the end of Year 8; competent and comfortable in their practical skills e.g. handling glassware, using lab equipment, making accurate observations as well as having a sound understanding of some of the key concepts across the sciences: body systems and microbes; particle models; chemical reactions; sound and light travel; genetics and evolution; material properties; respiration; forces. We need them to be able to take a piece of knowledge and not just see this as a fact but understand it and be able to apply it to unknown situations. As they head into Year 9 they will prepare for the step up to GCSE in Year 9. We don't want them to see science as Biology, Chemistry and Physics but rather as a subject that explains the phenomena, they see in the world around them encouraging them to want to find out more.

What will you be learning in Year 8 Science?



The topics you will study in Year 8 build on your **knowledge** and **understanding** of the **Year 7 content** to provide the foundations and principles for further study in science.

This foundation of knowledge, as well as the **practical skills learnt**, will equip you well to go on and study the broad range of topics on offer in future years. The skills you learn in each topic will prepare you for GCSE as well as to be curious, innovative, and independent scientists!



YEAR 8 CURRICULUM

<p>MasterChef</p>	<p>ES1 State the function of the different food groups ES2 Describe what a healthy diet is ES3 Describe and explain how digestion works ES4 Know the basic function of enzymes ES5 The effects of too much food (energy) and too little food (energy) on the body ES6 Understand the process of chromatography ES7 Define & understand conduction ES8 Define convection ES9 Define radiation ES10 Investigate insulation ES11 Record results on a graph ES12 State the features of the 3 microbes ES13 Describe how antibiotics were discovered ES14 Describe how a vaccine works</p>	<p>GD1 Describe and explain the function of bile within digestion GD2 Explain how temperature and pH can affect the function of enzymes GD3 Describe and apply the lock and key model to enzymes to be able to explain why enzymes are specific GD4 Calculating the Rf value GD5 Evaluate the use of antibiotics, discuss antibiotic resistance</p>
<p>Fireworks</p>	<p>ES1 Label amplitude and wavelength on a wave ES2 Define amplitude, wavelength and frequency ES3 Describe how the ear works ES4 Describe a sound based on waves ES5 Describe uses of ultrasound ES6 Convert units from J to KJ ES7 Define reflection and refraction ES8 Describe the flame tests and results ES9 Describe how we see different colours ES10 Draw a ray diagram to show how we see an object ES11 Describe the difference between opaque, translucent and transparent ES12 Describe the difference between transverse and longitudinal waves</p>	<p>GD1 Link the frequency and wavelength of a wave GD2 Explain the link between a microphone and a loudspeaker GD3 Explain how bats and dolphins use ultrasound GD4 Calculate wave speed using 2 different equations</p>

YEAR 8 CURRICULUM

<p>Down on the Farm</p>	<p>ES1 Be able to observe a cell structure using a light microscope ES2 Be able to label and plant and animal cell ES3 Describe the function of the different cell organelles ES4 Describe how different cells are specialised ES5 Know what adolescence is and the changes that take place in adolescence ES6 Know the biological structures and functions of the male and female reproductive systems ES7 Define the terms gamete, fertilisation and gestation ES8 Describe the stages of the menstrual cycle ES9 Know the feeding relationships between organisms within a food chain ES10 Know the feeding relationships between organisms within a food web ES11 Explain how food chains can be affected ES12 Describe how organisms are adapted to their environment and adapt to environmental changes ES13 Know the difference between inherited and environmental variation ES14 Use examples to show the difference between continuous and discontinuous variation ES15 Know the location of DNA in the cell and the structures that DNA forms ES16 Describe how characteristics are inherited ES17 Know the factors that lead to extinction and methods used to prevent extinction</p>	<p>GD1 Compare light microscope to electron microscope GD2 Calculate magnification of images observed using a microscope GD3 Describe the role of mitochondria and ribosomes GD4 Explain the cause of identical and non-identical twins GD5 Names the hormones involved in the menstrual cycle GD6 Calculate energy transfers along a food chain GD7 Define biodiversity</p>
<p>Mission to Mars</p>	<p>ES1 Know the particle arrangement and movement in different states ES2 Describe the changes of state ES3 Definitions of atom, element, molecule and compound ES4 Know the uses and physical and chemical properties of typical metals and non-metals ES5 Identify the groups and periods in the periodic table and identify trends in the properties of elements in groups ES6 Carry out reactions of metals with acids ES7 Write word equations of metals and acids reactions ES8 Carry out reactions of metals carbonates with acids ES9 Describe how to make a salt from an acid and a metal oxide</p>	<p>GD1 Write a chemical equation GD2 Symbol equations for metals and acid reactions</p>

YEAR 8 CURRICULUM

<p>Going for Gold</p>	<p>ES1 Describe the changes that take place inside the chest cavity when we inhale and exhale ES2 Know the interactions between the skeleton and the muscles ES3 Know some of the types of joint including and basic adaptations of joints ES4 Know what diffusion is in relation to cells ES5 Describe the difference between aerobic and anaerobic respiration ES6 Label the lungs and heart ES7 Describe the parts of the heart and function ES8 Explain what happens to heart and breathing rate during exercise ES9 Label the main bones in the human body</p>	<p>GD1 Write the symbol equation for aerobic and anaerobic respiration GD2 Explain how heart conditions can be treated GD3 Describe what osmosis is and how different to diffusion</p>
<p>TopGear</p>	<p>ES1 Calculate speed ES2 Label a distance-time graph ES3 Describe the factors affecting thinking and braking distance ES4 List some of the safety features on a car ES5 Label the forces acting on a moving car ES6 Describe what an electromagnet is ES7 Describe which poles will attract and repel each other ES8 Define pressure and recall unit ES9 Calculate pressure</p>	<p>GD1 Convert units and rearrange speed equation GD2 Identify scalar and vector quantities GD3 Label the magnetic field around an electromagnetic field GD4 Evaluate the effect of drag on different moving vehicles GD5 Describe some of the uses of gas pressure</p>

The Big Picture

Year Group: 9

Students begin to follow the GCSE specification in Science, beginning with modules that underpin much of the specification going on into Y10 and Y11. Practical skills are built upon from KS3. Continue to engender a love of learning in science, and developing their thinking skills.

Intent

Units covered: Practical Skills, B1 Cell Biology, C1 Atomic Structure, C9 Atmosphere, P3 Particle Model and B7 Ecology. *Skills and knowledge:* In these units students will develop how to demonstrate and apply knowledge and understanding of scientific ideas, scientific enquiry, techniques and procedures. They will begin to analyse, evaluate, judge and draw conclusions from experimental procedures. *Building on prior learning:* All units build on the fundamentals that students have learned in the thematic KS3 units which have elements of all three subject specialisms embedded within them. *Next steps:* All of the skills and many of the fundamental ideals learned in these modules will provide a firm base on which to build more complex scientific concepts and models.

Implementation

The units taught begin with practical skills in order to maintain curiosity and enjoyment in science, but also building the foundations of thinking critically, working through problems and utilizing the mathematical skills needed when analysis and interpreting experimental data. The GCSE units are taught as the building blocks for GCSE.

Home learning will be focused on flipped learning researching topics and completing past examination questions. Literacy and Numeracy skills are built in science, literacy through the use of 6 mark level of response questions and numeracy through the multiple equations and mathematical processes that students will need to employ in all three sciences (10% of the Biology, 20% of the Chemistry and 30% of the Physics GCSE content is L2 or equivalent mathematics).

Assessment:

All units include:

6 Mark LOR questions
Low stake testing
End of Unit Tests – using at least 2 practice tests prior to the actual test for all topics

Some units include:

Required practical tasks set by the exam board

Autumn Term
Practical Skills, B1 and C1

Spring Term
Practical skills
P3 and C9

Summer Term
Numeracy skills in Science
B7

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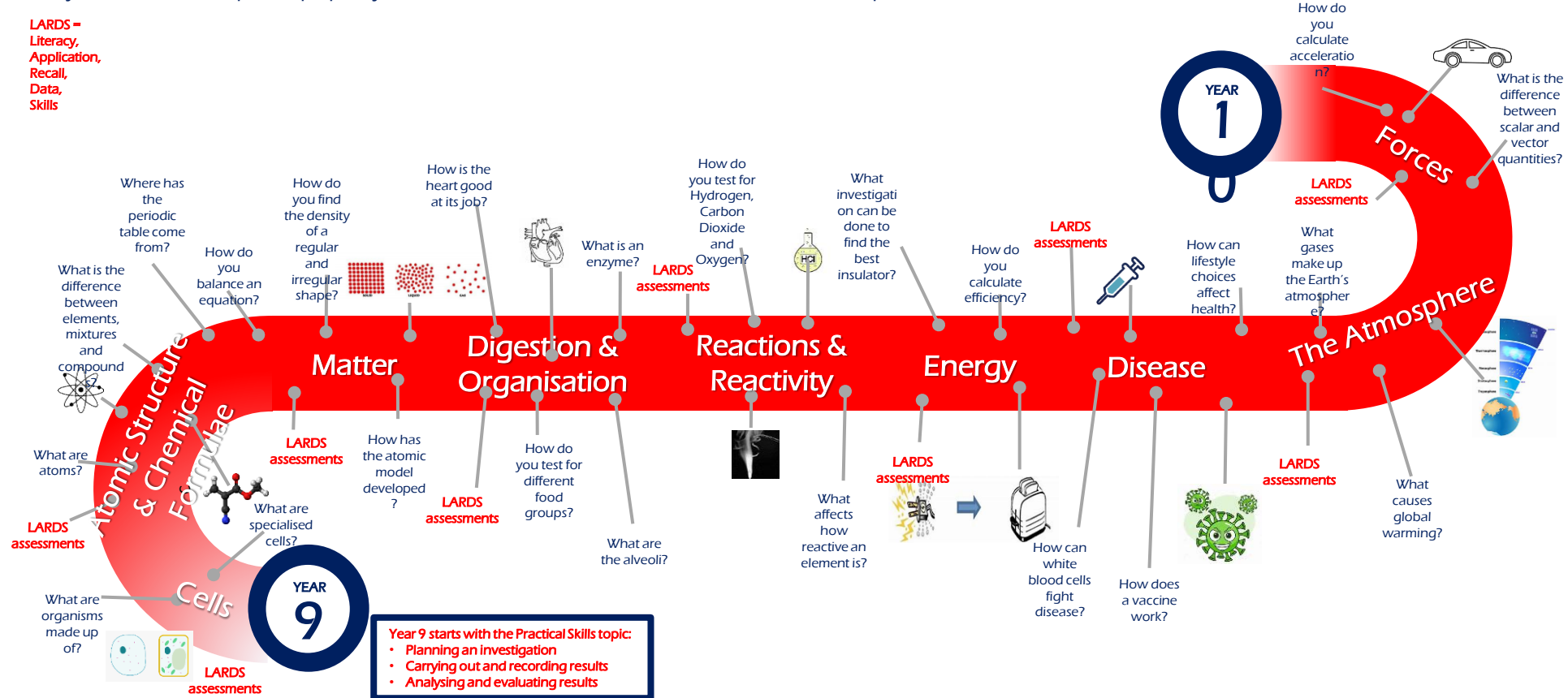
By the end of the Year students will be confident with the fundamental principles, knowledge and application of this knowledge in all three subject areas. They will be able to understand what they need to do in response to certain exam style questions and LOR questions. Practical skills will have developed from KS3 and they will be confident in suggesting improvements and describing methods. All these skills will be further developed in Y10 and Y11 in preparation for their GCSE examinations.

What will you be learning in Year 9 Science?



The topics you will study in Year 9 build on your **knowledge** and **understanding** of the **KS3 content** to provide the foundations and principles for further study in science.

This foundation of knowledge, as well as the **practical skills learnt**, will equip you well to go on and study the broad range of topics on offer in future years. The skills you learn in each topic will prepare you for GCSE as well as to be curious, innovative, and independent scientists!



Keeping a track of your progress: Your teacher will be assessing your progress informally every lesson. In addition, you will have at two pieces of work 'deep marked' (with written feedback) every half term, and you will be given time in the lesson to respond to the feedback in order to make further progress. Record your assessments here:

