

GCSE Triple Science – Biology

Curriculum Overview 2021-2022

Core aims of the subject at Key Stage 4

The complex and diverse phenomena of the natural world can be described in terms of a small number of key ideas in biology. These key ideas are of universal application, and we have embedded them throughout the subject content. They underpin many aspects of the science assessment. These ideas include:

- life processes depend on molecules whose structure is related to their function
- the fundamental units of living organisms are cells, which may be part of highly adapted structures including tissues, organs and organ systems, enabling living processes to be performed effectively
- living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways
- living organisms are interdependent and show adaptations to their environment
- life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen
- organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life
- the chemicals in ecosystems are continually cycling through the natural world
- the characteristics of a living organism are influenced by its genome and its interaction with the environment
- evolution occurs by a process of natural selection and accounts both for biodiversity and how organisms are all related to varying degrees.

Science has changed our lives and is vital to the world's future prosperity in such a technological age. Our students learn the essential knowledge, methods, processes and uses of science in order to be prepared for life in the modern world. Through building up a body of key knowledge and concepts, pupils will be encouraged to recognise the power of rational explanation and to inspire curiosity and a sense of excitement about natural phenomena. They will be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. Students be used to challenge, and will become future prepared, critical thinkers. We aim to inspire and produce motivated, highly skilled scientists who are independent life- long learners and who can accurately relate complex concepts to local and world- wide contexts.

At Brine Leas School we provide a balanced science curriculum with breadth and depth in order to help students achieve. Science does not stand alone and many of the concepts taught will help support a student's understanding of other subjects such as PE, Geography, History, Phsycology and Maths. At KS4 we follow the national curriculum using Kerboodle as a starting point for our lessons. This is an excellent, resource rich scheme, which we adapt to suit our students and our local context. In order to provide further breadth and depth, all students care encouraged to opt for Triple Science should they wish.

Periodic review and evaluation of the Science schemes of work continue to develop and respond to our intent to develop and embed challenge, metacognition, long-term retention and scientific literacy into our curriculum. The course aims to equip our young learners with the independent study skills they need to develop to be successful in their future pathways. Lesson powerpoints provide the basis for consistent of delivery of our curriculum and structured homeworks are set to support students in their independent learning to foster a culture of hard

work that leads to achievement and encourages life-long learning. Knowledge organisers and glossaries are provided at the start of topics to embed third tier vocabulary and to provide clarity of learning intent.

The main aim of our curriculum is to provide students with the key knowledge and skills to achieve well and become good scientists, with a clear understanding of the importance of science as a STEM subject in the modern world. Science is also vital for the personal development of well-rounded, informed, healthy individuals. Our curriculum supports students social, moral, spiritual and cultural development by facilitating a sense of enjoyment and fascination in learning about themselves, others and the world around them, use of imagination and creativity in their learning and encouraging a willingness to reflect on their experiences. Many topics such as genetic screening, human impact on the world, our changing atmosphere, generating electricity etc. provide the opportunity to create an interest in investigating and offering reasoned views about moral and ethical issues, and being able to understand and appreciate the viewpoints of others on these issues. Students are also encouraged to develop and use a range of social skills particularly during practical activities and project work. Science provides a platform to teach the fundamentally important biological knowledge that contributes to relationship and sex education and health and well-being. Throughout ks3 and 4 we explore key ideas address topics such as physical health and fitness, the effect of drugs, tobacco and alcohol, healthy eating, prevention of disease and adolescent bodies, sexual relationships, sexual health and contraception.

A significant focus is placed upon developing our students as accomplished practical scientists. Using the core principles of good investigative techniques and the associated maths skills. Students will experience what makes a strong and valid investigation and know how to develop their own method and carry out an investigation safely and efficiently. Building these practical skills throughout the course will enable all students to progress to A- level or science apprenticeships with a well-developed knowledge and wide experience of working scientifically. In addition to planning and carrying out an investigation the students will have to learn how to interpret and use the data or observations that they have generated. The skills that the students acquire in data analysis are invaluable as a transferable life skill. Also the ability to use calculations and determine the validity and significance of the data are wider skills that could be employed across many employment sectors. In the process of analysis they will learn to spot patterns and link that to scientific theory, again these skills are very transferable beyond a science setting.

Science at Brine Leas should be challenging, fascinating, and provide the knowledge and transferrable skills that are invaluable in preparing students for their life ahead. We aim for a large proportion of students to go on to study science further and to have science- based careers.

Trips and visits

Ecological sampling

Assessment

Termly exams in Biology consisting of a mixture of long and short answer and multiple choice questions- 15% of questions relate to practical skills, 20% of marks available will test maths skills. Hinge questions for each lesson.

Homework

exam style questions, revision (learning organisers and flashcards), required practical write-ups

Clubs and/or intervention

Revision sessions and homework support

Parental/Carer support

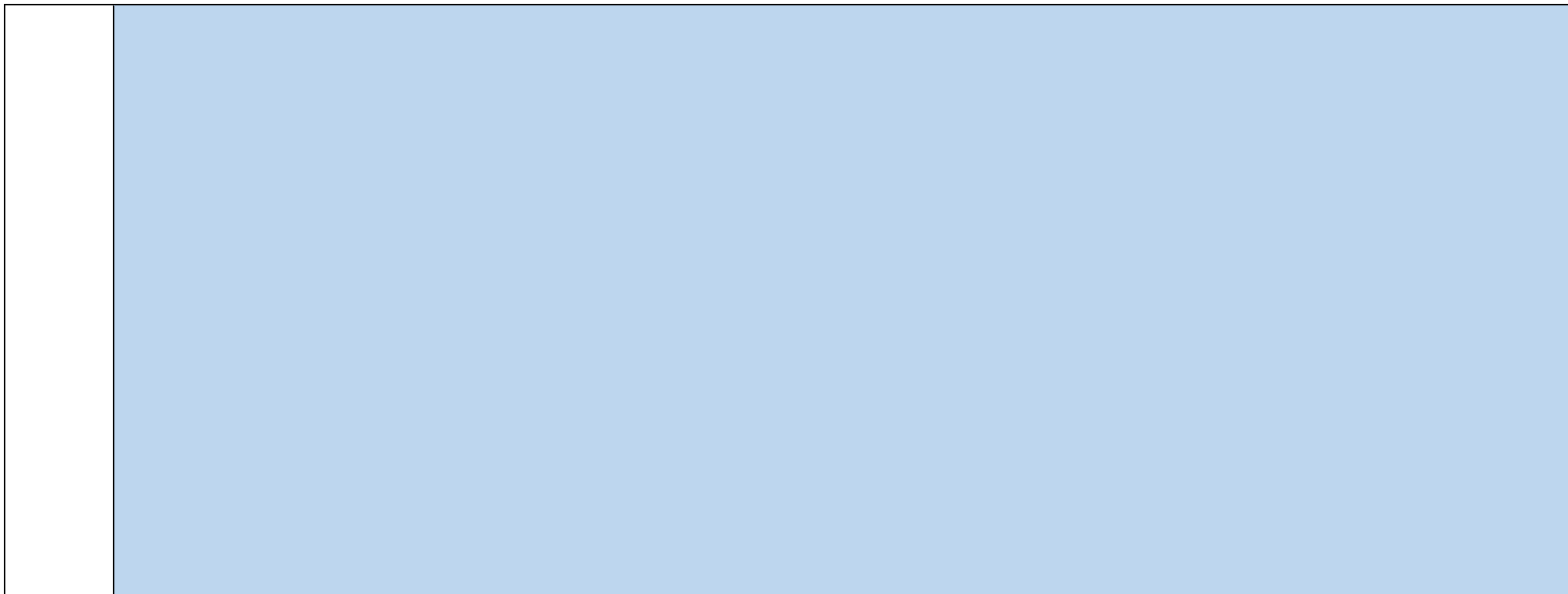
VLE resources/ parent fact sheet and email communication

Helpful sources of information

VLE, AQA, GCSE Bitesize, Kerboodle.com and Seneca learning

Year 10 Overview

Term	Knowledge	Assessment	Connections to learning	Connections to future pathways
Autumn 1	<p style="text-align: center;">Cell Biology, scientific and maths skills</p> <p>Science is a set of ideas about the material world. We have included all the parts of what good science is at GCSE level: whether it be investigating, observing, experimenting or testing out ideas and thinking about them. The way scientific ideas flow through the specification will support you in building a deep understanding of science with your students. We know this will involve talking about, reading and writing about science plus the actual doing, as well as representing science in its many forms both mathematically and visually through models. This specification encourages the development of knowledge and understanding in science through opportunities for working scientifically. Working scientifically is the sum of all the activities that scientists do. We feel it is so important that we have woven it throughout our specification and written papers. Our schemes of work will take this further for you and signpost a range of ways to navigate through this qualification so your students are engaged and enthused. These free resources support the use of mathematics as a tool for thinking through the use of mathematical language in explanations, applications and evaluations.</p> <p>Cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells.</p>			



<ul style="list-style-type: none">➤ <u>Cell Structure and transport</u>➤ The world of the microscope➤ Animal and plant cells➤ Eukaryotic and prokaryotic cells➤ Specialisation in animal cells➤ Specialisation in plant cells➤ Diffusion➤ Osmosis➤ Active transport➤ Exchanging materials	<ul style="list-style-type: none">➤ Exam style question (Multiple choice, structured, closed short answer, and open response) homework and required practical write ups➤ Unit 1 exam at the end of term➤ End of year 10 exam and mock exam➤ In lesson retrieval quiz and multiple choice hinge questions	<ul style="list-style-type: none">➤ KS3- food and nutrition, cells tissues and organs ,unicellular organisms, the particle model, Breathing and Respiration, Plant growth➤ KS4 bioenergetics and disease, biological responses	<p>Careers</p> <ul style="list-style-type: none">➤ Dietitian, sports nutritionist, physiotherapy, doctor, nurse, etc.➤ Industrial chemist, environmental chemistry, Pharmacist, lab technician,➤ Pathologist, Forensics, Botanists, Jewellers, Endocrinologists, Wildlife biologists, Biologists➤ Research physicist, electrician, and engineer, Plumber, Nuclear Physicist.
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	<ul style="list-style-type: none"> ➤ <u>Cell division</u> ➤ Growth and differentiation ➤ Stem cells ➤ Stem cell dilemmas 	<ul style="list-style-type: none"> ➤ Exam style question (Multiple choice, structured, closed short answer, and open response) homework and required practical write ups ➤ Unit 1 exam at the end of term ➤ End of year 10 exam and mock exam ➤ In lesson retrieval quiz and multiple choice hinge questions 	<ul style="list-style-type: none"> ➤ KS3 – cells, tissues and organs, reproduction, plant growth and reproduction ➤ KS4 – genetics and reproduction ➤ <u>SMSC 2 The Moral Development of pupils (B,C)</u> ➤ <u>HE 3 – physical health and fitness - C</u> 	<p>Future learning</p> <ul style="list-style-type: none"> ➤ Biology A level- health and social care, Biology/Biochemistry degree/biomedical science degree ➤ Chemistry A level, Forensic science, Chemistry, Btec National in applied science Biochemistry degree, Particle scientist ➤ Physics A level, engineering A level or equivalent, Physics degree, engineering apprenticeships
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Autumn 2	<p>Organisation, scientific and maths skills</p> <p>Science is a set of ideas about the material world. We have included all the parts of what good science is at GCSE level: whether it be investigating, observing, experimenting or testing out ideas and thinking about them. The way scientific ideas flow through the specification will support you in building a deep understanding of science with your students. We know this will involve talking about, reading and writing about science plus the actual doing, as well as representing science in its many forms both</p>
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mathematically and visually through models. This specification encourages the development of knowledge and understanding in science through opportunities for working scientifically. Working scientifically is the sum of all the activities that scientists do. We feel it is so important that we have woven it throughout our specification and written papers. Our schemes of work will take this further for you and signpost a range of ways to navigate through this qualification so your students are engaged and enthused. These free resources support the use of mathematics as a tool for thinking through the use of mathematical language in explanations, applications and evaluations.

In this section we will learn about the human digestive system which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis.

- Organisation and the digestive system
- Tissues and organs
- The human digestive system
- The chemistry of food
- Catalysts and enzymes
- Factors effecting enzymes
- How digestions works
- Making digestion efficient

- Exam style question (Multiple choice, structured, closed short answer, and open response) homework and required practical write ups
- Unit 1 exam at the end of term
- End of year 10 exam and mock exam
- In lesson retrieval quiz and multiple choice hinge questions

- KS3 cells, tissues and organs, food and nutrition, organisation plants and photosynthesis, the particle model
- KS4 disease and bioenergetics, biological responses
- HE 3 – physical health and fitness – A,B,C
- HE 4 – health eating (all)

- Careers
- Dietitian, sports nutritionist, physiotherapy, doctor, nurse, etc.
- Future learning
- Biology A level- health and social care, Biology/Biochemistry degree/biomedical science degree

Spring
1

Organisation, scientific and maths skills

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<ul style="list-style-type: none"> ➤ <u>Organising plants and animals</u> ➤ The blood ➤ The blood vessels ➤ The heart ➤ Helping the heart ➤ Breathing and gas exchange ➤ Tissues and Organs ➤ Transport systems in plants ➤ Evaporation and transpiration ➤ Factors effecting transpiration 	<ul style="list-style-type: none"> ➤ Exam style question (Multiple choice, structured, closed short answer, and open response) homework and required practical write ups ➤ Unit 1 exam at the end of term ➤ End of year 10 exam and mock exam ➤ In lesson retrieval quiz and multiple choice hinge questions 	<ul style="list-style-type: none"> ➤ KS3 – cells, tissues and organs. Food and nutrition, breathing and respiration, plant growth and reproduction <ul style="list-style-type: none"> ➤ KS4 Bioenergetics Biodiversity and ecosystems and environmental chemistry ➤ <u>SMSC 2 The Moral Development of pupils (B,C)</u> ➤ <u>HE 3 – physical health and fitness – A,B,C</u> ➤ <u>HE 7 Basic first aid - C</u> 	<p>Careers</p> <ul style="list-style-type: none"> ➤ Doctor, nurse, physiotherapist, radiographer Cardiologist, etc. Horticulture, agriculture Arborist, Bioprocessing Engineer, Environmental Scientist, Forestry Consultant, Forest Scientist, Forestry Technician, Horticultural Scientist, Irrigation Engineer. <p>Future learning</p> <ul style="list-style-type: none"> ➤ Applied science, Biology A level Forensic science, , Btec National in applied science, Environmental science, Biochemistry degree
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Spring
2

Infection and response, scientific and maths skills

Science is a set of ideas about the material world. We have included all the parts of what good science is at GCSE level: whether it be investigating, observing, experimenting or testing out ideas and thinking about them. The way scientific ideas flow through the specification will support you in building a deep understanding of science with your students. We know this will involve talking about, reading and writing about science plus the actual doing, as well as representing science in its many forms both mathematically and visually through models. This specification encourages the development of knowledge and understanding in science through opportunities for working scientifically. Working scientifically is the sum of all the activities that scientists do. We feel it is so important that we have woven it throughout our specification and written papers. Our schemes of work will take this further for you and signpost a range of ways to navigate through this qualification so your students are engaged and enthused. These free resources support the use of mathematics as a tool for thinking through the use of mathematical language in explanations, applications and evaluations.

Pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. Since the 1940s a range of antibiotics have been developed which have proved successful against a number of lethal diseases caused by bacteria. Unfortunately many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics.

- Communicable diseases
- Health and disease
- Pathogens and disease
- Preventing infections
- Viral diseases
- Bacterial diseases
- Diseases caused by fungi and protists
- Human defence responses
- More about plant diseases
- Plant defence responses

- Exam style question (Multiple choice, structured, closed short answer, and open response) homework and required practical write ups
- Aqa end of year 10 exam- term 2 and mock exams
- In lesson retrieval quiz and multiple choice hinge questions

- KS4 health and disease, vaccines, muscles and bones, non-communicable disease and antibiotic resistance, C and L cell cycle, drugs testing, and preventing disease, Radioactivity
- KS3 unicellular organisms, muscles and bones plant growth and reproduction
- HE 4 (all) physical health and fitness

Careers

- Doctor, nurse, research scientist, pharmacist, agriculture, horticulture

Future learning

- Biology A level- health and social care, Biology/Biochemistry degree/biomedical science degree, medical degree, dentistry, agriculture, horticulture

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			<ul style="list-style-type: none">➤ <u>HE 5 (all) Drugs, alcohol and tobacco</u>➤ <u>HE 6 - health and prevention(all)</u>➤ <u>RSE Intimate sexual relationships, including sexual health (I,J)</u>	
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	<ul style="list-style-type: none"> ➤ <u>Preventing and treating disease</u> ➤ Vaccination ➤ Antibiotics and painkillers ➤ Discovering drugs ➤ Developing drugs ➤ Making Monoclonal antibodies ➤ Use of monoclonal antibodies ➤ <u>Non-communicable diseases</u> ➤ Cancer ➤ Smoking and the risk of disease ➤ Diet exercise and disease ➤ Alcohol and other carcinogens 	<ul style="list-style-type: none"> ➤ Exam style question (Multiple choice, structured, closed short answer, and open response) homework and required practical write ups ➤ Aqa end of year 10 exam- term 2 and mock exams ➤ In lesson retrieval quiz and multiple choice hinge questions 	<ul style="list-style-type: none"> ➤ KS4 health and disease, vaccines, muscles and bones, non-communicable disease and antibiotic resistance, C and L cell cycle, drugs testing, and preventing disease, Radioactivity ➤ KS3 unicellular organisms, muscles and bones ➤ <u>HE 3 – physical health and fitness – A,B,C</u> ➤ <u>HE 4 (all) physical health and fitness</u> ➤ <u>HE 5 (all) Drugs, alcohol and tobacco</u> ➤ <u>HE 6– Health and prevention (all)</u> ➤ <u>RSE Intimate sexual relationships, including sexual health (I,J)</u> 	<p>Careers</p> <ul style="list-style-type: none"> ➤ Doctor, nurse, research scientist, pharmacist, agriculture, horticulture, immunologist, Laboratory technician, Biochemist, Antibody formulation scientist, Analytical scientist, Global health researcher, Dietitian, Public Health project manager. Radiation therapist, Oncologist, Oncology nurse, Medical Scientist, Dosimetrist, Nutritionist, Sports and Exercise Nutrition, Physiotherapist, Sports therapist, Wellness coach, Psychiatrist, Psychologist, Clinical Social Worker, Counsellor. <p>Future learning</p> <ul style="list-style-type: none"> ➤ Biology A level- health and social care, Biology/Biochemistry degree/biomedical science degree, medical degree, dentistry, agriculture,
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				<p>horticulture, Biopharmaceuticals, Social Sciences, Human nutrition degree, Fitness and nutrition, Drug and alcohol studies.</p>
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Summer
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Bioenergetics scientific and maths skills

Science is a set of ideas about the material world. We have included all the parts of what good science is at GCSE level: whether it be investigating, observing, experimenting or testing out ideas and thinking about them. The way scientific ideas flow through the specification will support you in building a deep understanding of science with your students. We know this will involve talking about, reading and writing about science plus the actual doing, as well as representing science in its many forms both mathematically and visually through models. This specification encourages the development of knowledge and understanding in science through opportunities for working scientifically. Working scientifically is the sum of all the activities that scientists do. We feel it is so important that we have woven it throughout our specification and written papers. Our schemes of work will take this further for you and signpost a range of ways to navigate through this qualification so your students are engaged and enthused. These free resources support the use of mathematics as a tool for thinking through the use of mathematical language in explanations, applications and evaluations.

In this section we will explore how plants harness the Sun's energy in photosynthesis in order to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this oxygen to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue.

<ul style="list-style-type: none"> ➤ <u>Photosynthesis</u> ➤ The rate of photosynthesis ➤ How plants use glucose ➤ Making the most of photosynthesis ➤ <u>Respiration</u> ➤ Aerobic respiration ➤ The response to exercise ➤ Anaerobic respiration ➤ Metabolism and the liver 	<ul style="list-style-type: none"> ➤ Exam style question (Multiple choice, structured, closed short answer, and open response) homework and required practical write ups ➤ Aqa end of year 10 exam- term 2 and mock exams 	<ul style="list-style-type: none"> ➤ KS3 cells and life processes, plant growth, photosynthesis and respiration, chemical change, ecology ➤ KS4 Ecology, chemical changes, energy changes, homeostasis. <p><u>HE 3 physical health and fitness (all)</u> <u>HE 4 (a) Healthy eating</u></p>	<p>Careers</p> <ul style="list-style-type: none"> ➤ Horticulturalist, Farming, Doctor, nurse, research scientist, Forestry, Food Science Technician, Plant Biochemist, ➤ Respiratory therapist, Athletic trainer, Exercise physiologist, Physical therapist, Neonatal/Paediatric Respiratory Care Specialist.
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		<p>➤ In lesson retrieval quiz and multiple choice hinge questions</p>	<p><u>HE 6 Health and prevention (A,D)</u></p>	<p>Future learning</p> <p>➤ Biology A level- health and social care, Biology/Biochemistry degree/biomedical science degree, medical degree, dentistry, Horticultural degree, Plant Science, Botany, Respiratory therapy.</p>
<p>Summer 2</p>	<p style="text-align: center;">Complete topics from last term, mock exam, ecology, scientific and maths skills, homeostasis and response</p> <p>Science is a set of ideas about the material world. We have included all the parts of what good science is at GCSE level: whether it be investigating, observing, experimenting or testing out ideas and thinking about them. The way scientific ideas flow through the specification will support you in building a deep understanding of science with your students. We know this will involve talking about, reading and writing about science plus the actual doing, as well as representing science in its many forms both mathematically and visually through models. This specification encourages the development of knowledge and understanding in science through opportunities for working scientifically. Working scientifically is the sum of all the activities that scientists do. We feel it is so important that we have woven it throughout our specification and written papers. Our schemes of work will take this further for you and signpost a range of ways to navigate through this qualification so your students are engaged and enthused. These free resources support the use of mathematics as a tool for thinking through the use of mathematical language in explanations, applications and evaluations.</p> <p>Suitable habitats for ecological sampling at this time of year. Paper 1 content complete in time for mock exams</p> <p>Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility.</p>			

<ul style="list-style-type: none"> ➤ <u>ecological sampling</u> ➤ The importance of communities ➤ organisms in their environment ➤ distribution and abundance 	<ul style="list-style-type: none"> ➤ required practical sheet and exam questions ➤ In lesson retrieval quiz and multiple choice hinge questions 	<ul style="list-style-type: none"> ➤ KS3 ecosystems maths skills, plants and their reproduction and growth ➤ KS4 ecology ➤ <u>SMSC 2 The Moral Development of pupils (B,C)</u> 	<p>Careers</p> <ul style="list-style-type: none"> ➤ Horticulture, agriculture ecologist, environmental scientist, environmental Health officer <p>Future learning</p> <ul style="list-style-type: none"> ➤ Biology A level- health and social care, Biology/Biochemistry environmental science degree, Horticultural degree
<ul style="list-style-type: none"> ➤ <u>Biological responses</u> ➤ <u>The human nervous system</u> ➤ Principles of homeostasis ➤ The structure and function of the nervous system ➤ Reflex actions ➤ The brain ➤ The eye ➤ Common problems of the eye 	<ul style="list-style-type: none"> ➤ exam style questions (Multiple choice, structured, closed short answer, and open response) / mock paper 2 exam/ hinge questions/ retrieval quiz, required practical sheets 	<ul style="list-style-type: none"> ➤ KS3 cells, tissues and organs, reproduction, digestion, muscles and bones. ➤ KS4 organisation ➤ <u>SMSC 2 The Moral Development of pupils (B,C)</u> ➤ <u>RSE Intimate sexual relationships, including sexual health (I,J)</u> ➤ <u>HE 5 – Drugs, alcohol and tobacco (all)</u> ➤ <u>HE 6 Health and prevention – E</u> 	<p>Careers physiotherapy psychiatrist, brain surgeon, ophthalmologist, optician, Orthoptist, Optometrist, window cleaner, cameraman, Electroneurodiagnostic Technician, Audiology, Dentistry, Pharmacist, Education, Neural Engineering, Psychobiologist, Neuroscientist, Neuroanatomist, Neurobiologist, Neurochemist, Neurological surgeon, Neurologist, Neuroradiologist, Biomedical scientist, Endocrinologist.</p> <p>Future learning</p>

				<ul style="list-style-type: none"> ➤ Biology A level- health and social, Optometry and Visual Science.
				<ul style="list-style-type: none"> ➤ care, Biology/Biochemistry environmental science degree, Horticultural degree,

Year 11 Overview

Term	Knowledge	Assessment	Connections to learning	Connections to future pathways
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Homeostasis and response, scientific and maths skills

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➤ Hormonal coordination
➤ Principles of hormonal control, glands and hormones

➤ Exam style questions (Multiple choice, structured, closed short answer, and open

➤ KS3 –reproduction, cells tissues and organs, plants and their reproduction and growth,

Careers
➤ Diabetic nurse, agriculture, horticulture, IVF nurse IVF doctor, horticulture,

	<ul style="list-style-type: none"> ➤ control of blood glucose ➤ treating diabetes ➤ the role of negative feedback ➤ human reproduction ➤ hormones and the menstrual cycle ➤ the artificial control of fertility ➤ infertility treatments ➤ plant hormones and responses ➤ using plant hormones 	<p>response) / mock paper 2 exam/ hinge questions/ retrieval quiz, required practical sheets</p>	<p>muscles and bones, breathing and respiration</p> <ul style="list-style-type: none"> ➤ KS4 – cells and organisation ➤ <u>HE8 Changing adolescent bodies (all)</u> ➤ <u>SMSC 2 The Moral Development of pupils (B,C)</u> ➤ <u>RSE Intimate sexual relationships, including sexual health (I,J)</u> 	<p>agriculture, Endocrinology Specialist Nurse, Diabetologist, Gastroenterologist, Urologist, Research Assistant, Dietitian, Research Endocrinologist, Clinical Endocrinologists, Paediatric Endocrinologist, Doctor, Nurse, Gynaecologist, Public health practitioners, Pharmacists, Embryologists, Andrologist, Infertility counsellor/Support Advisor.</p> <p>Future learning</p> <ul style="list-style-type: none"> ➤ Biology A level- health and social ➤ care, Biology/Biochemistry environmental science degree, Horticultural degree, agriculture, Human anatomy and Physiology, Medical Physiology and Therapeutics. Clinical Endocrinology.
<p>Autumn 2</p>	<p style="text-align: center;">Homeostasis and response, Inheritance, variation and evolution, scientific and maths skills</p> <p>Science is a set of ideas about the material world. We have included all the parts of what good science is at GCSE level: whether it be investigating, observing, experimenting or testing out ideas and thinking about them. The way scientific ideas flow through the specification will support you in building a deep understanding of science with your students. We know this will involve talking about, reading and writing about science plus the actual doing, as well as representing science in its many forms both mathematically and visually through models. This specification encourages the development of knowledge and understanding in science through opportunities for working scientifically. Working scientifically is the sum of all the activities that scientists do. We feel it is so important that we have woven it throughout our specification and written papers. Our schemes of work will take this further for you and signpost a range of ways to navigate through this qualification so your students are engaged and enthused.</p>			

These free resources support the use of mathematics as a tool for thinking through the use of mathematical language in explanations, applications and evaluations.

Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility.

<ul style="list-style-type: none"> ➤ <u>Homeostasis in action</u> ➤ Controlling body temperature ➤ Removing waste products ➤ The human kidney ➤ Dialysis – an artificial Kidney ➤ Kidney transplants 	<ul style="list-style-type: none"> ➤ exam style questions (Multiple choice, structured, closed short answer, and open response) / mock paper 2 exam/ hinge questions/ retrieval quiz, required practical sheets 	<ul style="list-style-type: none"> ➤ KS3 - cells tissues and organs, systems, breathing and respiration, muscles and bones, food and nutrition ➤ KS4- cells and organisation ➤ <u>HE 6– Health and prevention (all)</u> ➤ <u>KS4</u> B3 Organisation and the digestive system, B9 Respiration, B18 Biodiversity and ecosystems 	<p>Careers</p> <ul style="list-style-type: none"> ➤ Doctor, Nurse, renal specialist, kidney dialysis nurse, medical technician/engineer, urologist <p>Future learning</p> <ul style="list-style-type: none"> ➤ Biology A level- health and social ➤ care, Biology/Biochemistry environmental science degree, Horticultural degree,
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<ul style="list-style-type: none"> ➤ <u>Reproduction and variation and evolution</u> ➤ Types of reproduction ➤ Cell division in sexual reproduction ➤ The best of both worlds ➤ DNA and the genome ➤ DNA structure and protein synthesis ➤ Gene expression and mutation ➤ Inheritance in action 	<ul style="list-style-type: none"> ➤ exam style questions (Multiple choice, structured, closed short answer, and open response) / mock paper 2 exam/ hinge questions/ retrieval quiz, required practical sheets 	<ul style="list-style-type: none"> ➤ KS3 reproduction, cells, tissues and organs, genetics and variation, health and disease. ➤ KS4 cells and organisation, biological responses ➤ <u>SMSC 2 The Moral Development of pupils (B,C)</u> 	<p>Careers</p> <ul style="list-style-type: none"> ➤ Genetic counsellor, research scientist, Horticulture, Agriculture, Geneticist, Cytogeneticist, Genetic technologist, Environmental geneticist, Research assistant, Bioethicist, Botanist, Gardeners, Future learning ➤ Biology A level- health and social
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<ul style="list-style-type: none"> ➤ More about genetics ➤ Inherited disorders ➤ Screening for genetic disorders ➤ <u>Variation and evolution</u> ➤ Variation ➤ Evolution ➤ Selective breeding ➤ Genetic engineering ➤ Cloning ➤ Adult cell cloning ➤ Ethics of genetic technologies 			<ul style="list-style-type: none"> ➤ care, Biology/Biochemistry environmental science degree, Genetics degree.
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Inheritance, variation and evolution, scientific and maths skills

**Spring
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In this section we will discover how the number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the individual. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Scientists have now discovered how to take genes from one species and

introduce them in to the genome of another by a process called genetic engineering. In spite of the huge potential benefits that this technology can offer, genetic modification still remains highly controversial.

<ul style="list-style-type: none"> ➤ <u>Genetics and evolution</u> ➤ The history of genetics ➤ Theories of evolution ➤ Accepting Darwin's ideas ➤ Evolution and speciation ➤ Evidence for evolution ➤ Fossils and extinction ➤ Antibiotic resistance ➤ Classification ➤ New classification systems ➤ <u>Ecology</u> ➤ The importance of Communities (review) ➤ Organisms in their environment(review) ➤ Abundance and distribution (review) ➤ Competition in plants and animals ➤ Adaptations in plants and animals ➤ <u>Organising and ecosystem</u> ➤ Feeding relationships ➤ Materials cycling ➤ Carbon cycle ➤ Rates of decomposition 	<ul style="list-style-type: none"> ➤ exam style questions (Multiple choice, structured, closed short answer, and open response) / mock paper 2 exam/ hinge questions/ retrieval quiz, required practical sheets 	<ul style="list-style-type: none"> ➤ KS3, genetics and evolution, ecology, plant growth, unicellular organisms, reproduction ➤ KS4 cells and organisation, biological responses ➤ <u>SMSC 2 The Moral Development of pupils (B,C)</u> 	<p>Careers</p> <ul style="list-style-type: none"> ➤ Genetic counsellor, research scientist, Naturalist, ecologist, environmental scientist, Ecologist, Farmer, agricultural scientist. Palaeontologist, Paleobiologist, Pharmacist, Microbiologist, Botanist, Zoologist. Astrobiologist, Conservation Biologist, Environmental Planner, Conservation and Environmental protection, Botanist, Zoologist. <p>Future learning</p> <ul style="list-style-type: none"> ➤ Biology A level- health and social care, Biology/Biochemistry environmental science degree, Genetics degree, Zoology, horticulture, agriculture, Palaeontology degree. Paleobiology degree, Microbiology degree, Taxonomy degree, Botany degree, Environmental Engineering, Conservation
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Biology, Environmental Management, Ecological Restoration.

Inheritance, variation and evolution, scientific and maths skills

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Spring
2

<ul style="list-style-type: none"> ➤ <u>Biodiversity and ecosystems</u> ➤ The human population explosion ➤ Land and water pollution ➤ Air pollution ➤ Deforestation and peat destruction ➤ Global warming ➤ The impact of change ➤ Maintaining biodiversity ➤ Trophic levels and biomass ➤ Biomass transfers ➤ Factors affecting food security ➤ Making food production more efficient ➤ Sustainable food production 	<ul style="list-style-type: none"> ➤ exam style questions (Multiple choice, structured, closed short answer, and open response) / mock paper 2 exam/ hinge questions/ retrieval quiz, required practical sheets 	<ul style="list-style-type: none"> ➤ KS3 ecosystems, unicellular organisms, combustion, energy resources, plants and their reproduction and growth ➤ KS4 the Earth's resources, organic chemistry (chemistry) ➤ <u>SMSC 2 The Moral Development of pupils (B,C)</u> 	<p>Careers</p> <ul style="list-style-type: none"> ➤ Horticulturalist, Farming, ecologist, environmental scientist, environmental Health officer, fishing, utilities, forestry, dairy <p>Future learning</p> <ul style="list-style-type: none"> ➤ Biology A level- health and social care, Biology/Biochemistry environmental science degree, Horticultural degree
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Scientific and maths skills

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	<ul style="list-style-type: none"> ➤ Using a light microscope (review) ➤ Investigating the effect of antiseptics/antibiotics (review) 	<ul style="list-style-type: none"> ➤ Review all mock/unit/end of year exams ➤ Review required practicals ➤ Practice maths skills 	<ul style="list-style-type: none"> ➤ KS3 – ecosystems, food and nutrition, plant reproduction and growth, respiration and breathing, muscles and bones, reproduction, the 	
	<ul style="list-style-type: none"> ➤ Investigating osmosis (review) ➤ Food tests (review) ➤ Investigating the effect of pH on enzyme activity(review) ➤ Investigating the effect of light intensity on the rate of photosynthesis(review) ➤ Investigating reaction times(review) ➤ Investigating the effect of light or gravity on plant growth(review) ➤ Measuring the population size of a species(review) ➤ Investigating the effect of temperature on the decay of milk(review) ➤ Arithmetic and numerical computation ➤ Data handling ➤ Algebra ➤ Graphs ➤ Geometry and trigonometry 	<ul style="list-style-type: none"> ➤ Review 'working scientifically' terminology 	<ul style="list-style-type: none"> particle model, unicellular organisms, ➤ KS4 all topics, Earth's resources (chemistry) ➤ Maths ➤ Chemistry ➤ Physics 	