



# Woodlane High School

achieving success in a nurturing environment

# Subject Policy: Science

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## **Rationale – What is the evidence base for selected strategies and curriculum choices?**

This section is kept succinct to ensure this policy remains accessible to a variety of audiences. Please review our Teaching and Learning Policy for further information on our whole school approach and evidence informed practice. We have selected 3 subject specific areas of focus to highlight our evidence informed practice, as follows:

### **14 Big Ideas**

A curriculum based on 14 big ideas of science and ideas about science help pupils develop their understanding of and curiosity about science. In 2009 a group of experts in science education working with the Association for Science Education identified the key ideas that pupils should encounter in their science education to enable them to understand, enjoy and marvel at the natural world. Derek Bell et al (2010) *The Principles and big ideas of Science Education*. They agreed on 14 big ideas of and about science.

The ideas of science were:

- *All material in the Universe is made of very small particles.*
- *Objects can affect other objects at a distance.*
- *Changing the movement of an object requires a net force to be acting on it.*
- *The total amount of energy in the Universe is always the same but energy can be transformed when things change or are made to happen.*
- *The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate.*
- *The solar system is a very small part of one of millions of galaxies in the Universe.*
- *Organisms are organised on a cellular basis.*
- *Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms.*
- *Genetic information is passed down from one generation of organisms to another.*
- *The diversity of organisms, living and extinct, is the result of evolution*

The ideas about science were:

- *Science assumes that for every effect there is one or more causes.*
- *Scientific explanations, theories and models are those that best fit the facts known at a particular time.*
- *The knowledge produced by science is used in some technologies to create products to serve human ends.*
- *Applications of science often have ethical, social, economic and political implications.*

The benefits of using this model have been positively evaluated in Bell et al (2015) Working with Big ideas of Science Education. Our Science curriculum is built around these ideas but tailored to meet the needs of pupils working both at and below their chronological age.

### ***Practical Activities in Science Enhance the Learning Experience for Pupils***

The importance of practical work for all pupils especially pupils with special educational needs has been well documented. The Gatsby Foundation, (2017) Good Practical Science, [www.gatsby.org.uk](http://www.gatsby.org.uk) recommended at least 50% of science lessons should have a practical element for pupils in secondary schools. At Woodlane the pupils complete practical tasks far more frequently. A report by The House of Commons Science and Technology Committee, (2011) suggests practical work gives meaning to theory and can help to develop practical skills beneficial in future careers.

Our curriculum includes frequent practical tasks in a variety of forms. These include but are not limited to carrying out simple chemical reactions, investigating forces and energy transfers and measuring pulse rate in key stage 3. Modelling DNA, comparing energy efficiency and investigating osmosis in key stage 4. During their time at Woodlane pupils also have the opportunity to visit the Science Museum and other venues to experience hands on activities outside the classroom environment.

### ***Science Influences All Our Lives and the World Around Us***

Science needs to be relevant to pupil's lives and the application of more theoretic science made clearer if pupils are to engage with the subject. *"Conveying the wider relevance of science to everyday life and to wider contexts may help to foster students' interest in and perceived utility of science"* Sheldrake et al (2017)

Work by Mc Cullagh and Doherty (2019) suggests using everyday contexts within science lessons *"makes science phenomena recognisable and accessible and allows children to begin to engage with often abstract and challenging ideas"*

The science taught in class is linked to our daily lives and real-world events. Pupils in key stage 4 follow an Entry Level Certificate or GCSE syllabus which puts a strong emphasis on the science pupils are likely encounter in the world around them.

### **References:**

Bell D, Devés R, Dyasi H, Fernández de la Garza G, Harlen W, Léna P, Millar R, Reiss M J, Rowell P, and Yu W (2010) The Principles and big ideas of Science Education, The Association for Science Education

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House of Commons Science and Technology Committee, (2011) Practical experiments in school science lessons and science field trips, 9<sup>th</sup> Report of session 2010-12.

McCullagh J F and Doherty A (2019) The Benefits of setting science in an everyday context: A primary context. *School Science Review*, 100 (372), 21-27.

Sheldrake R, Mujtaba T and Reiss MJ. (2017) Science Teachers and students' attitudes and aspirations: The importance of conveying the applications and relevance of science *International Journal of Educational Research* 85 167-183

### **Intent – What is Woodlane aiming to achieve through its Science curriculum?**

- To develop an understanding of the concepts, processes and methods of science through different science enquiries that help pupils learn about the world around them.
- To enthuse pupils by engaging them in practical activities that help them develop a passion for Science.
- To develop the habit of regular revision through reading, watching educational programmes and videos, and completing written tasks including, past papers in order to practice exam techniques.
- To relate Science to other subjects and to real life, and help pupils acquire ecological culture and behaviour.
- To develop pupils' ethical, social and cultural awareness in a variety of ways based on practical and reflective tasks in Science lessons.
- To equip pupils with sound knowledge of the subject, required to understand the uses and implications of Science and inspire them for future STEM careers.
- To ensure pupils leave Woodlane with a Science qualification which reflects the best of their ability.

### **Implementation – How is the Woodlane Science curriculum delivered?**

#### **Curriculum Delivery**

- Pupils have full access to the Science National Curriculum which is differentiated to meet pupils' learning needs and styles.
- The Science curriculum is designed to be challenging, appropriate to each pupil's stage of development.
- The Science curriculum offers opportunities for cross-curricula learning, to ensure pupils make significant personal development, including:
  - ✓ STEM lessons;
  - ✓ Science days;
  - ✓ participation in events such as British Science Week, the Big Bang Fair, The Royal Society Summer exhibition
  - ✓ In-class interactive workshops aligned to STEM objectives;
  - ✓ educational visits;
  - ✓ SaLT strategies/Word Aware integrated in to teaching;
  - ✓ Development of communication skills through discussions, paired and group work, educational games and formal presentations;
  - ✓ use of media and websites to explore advancements in Science.
- The KS3 Science curriculum is taught through 2.33 hours (average) contact time per week (12% curriculum time). This equates to:
  - ✓ Year 7 = 4 lessons, 3.33 hours contact time, (13.3% curriculum time). One of these lessons are taught with a focus on biology through Physical Education.
  - ✓ Year 8 = 4 lessons, 3.33 hours contact time, (13.3% curriculum time). One of these lessons are taught with a focus on food science through Design Technology Food.
  - ✓ Year 9 = 3 lessons, 2.5 hours of contact time, (10% curriculum time).
- The KS4 Science curriculum is taught through 2.78 hours (average) contact time per week (13% curriculum time). This equates to:
  - ✓ Year 10 = 3 lessons, 2.5 hours of contact time, (10% curriculum time).
  - ✓ Year 11 GCSE Group = 4 lessons, 3.33 hours contact time, (13.3% curriculum time).
  - ✓ Year 11 Entry Level Group = 3 lessons, 2.5 hours of contact time, (10% curriculum time).
- Recovery Lessons are timetabled for all of KS3 (x3 lessons per week), and Year 10 (x1 lessons per week). These lessons ensure dedicated curriculum time is provided to identified areas need. The topics and subjects covered are based on the school's data, teacher observation and assessment.
- The Science curriculum is designed to build and expand on previous skills and subject knowledge, over a 5-year period. It also plans for opportunities for repetition to embed knowledge, increasing the chance of information recall and to

integrate new knowledge into larger ideas (view our Science curriculum map in the appendix).

- The school offers the following qualifications in Science, which are selected to appropriately challenge, based on each pupil's stage of development, including:
  - ✓ GCSE Biology (OCR)
  - ✓ Entry Level Certificate in Science (OCR)
  - ✓ AQA Unit Awards
- Science is vital in understanding the world around us. '*working scientifically*' is embedded within the content of biology, chemistry and physics, and focuses on the key features of scientific enquiry.
- The school provides opportunities for pupils to learn through enjoyment, and therefore pupils experience real-life problem-solving challenges, and also Science trips where they participate in exciting activities.
- We provide additional extra-curricular activities at lunch time or after school, including:
  - ✓ GCSE Science support
  - ✓ Science club
  - ✓ Homework support

## Teaching and Learning

- Our pupils are taught by transition teachers in Year 7 and subject specialists from Year 8 to Year 11.
- Our Science Subject Leader is well qualified, possessing a PGCE in Secondary Science, a Master's Degree in Science Education and is a qualified teacher of the deaf.
- The Science curriculum is differentiated broadly into 3 levels of challenge, 'all', 'most' and 'some'. Further differentiation and personalisation is implemented when required.
- Science homework is provided on a standardised format and is differentiated to provide the appropriate level of challenge using 3 levels of challenge, 'all', 'most' and 'some'.
- In Science we have a 3-tiered approach to supporting a pupil's learning, including:

**Universal** – this is the teaching your child will receive from the Science subject teachers and will include adaptations to match learning needs. All classes:

- ✓ are supported by a teaching assistant (TA);
- ✓ have a maximum of 12 pupils per class to ensure there is a high level of support available from the teacher and TA;
- ✓ are multi-sensory;
- ✓ are dyslexia friendly;

- ✓ integrate speech, language and communication support.

**Targeted** – it may be appropriate to consider making additional short term special educational provision to remove or reduce any obstacles to your child’s learning. This takes the form of a graduated four-part approach of a) **assessing** your child’s needs, b) **planning** the most effective and appropriate intervention, c) **providing** this intervention and d) **reviewing** the impact on your child’s progress towards individual learning outcomes.

Interventions may include:

- ✓ targeted teacher support with focus on preparing pupils for exams;
- ✓ Year 11 Science support club;
- ✓ one to one support in lessons; and
- ✓ termly Science targets.

**Specialist** – it may be necessary to seek specialist advice and regular long-term support from a specialist professional in order to plan for the best possible learning outcomes for your child.

## **Assessment**

- Pupils collate Pupil Achievement Books, where they showcase their best work and progress over time in Science.
- Our bespoke Flight Path is used to track the progress of pupils in Science and determine expected outcomes from different starting points
- Science teachers use a range of formative and summative assessment procedures to assess progress and attainment, including:
  - ✓ daily marking (click here for teaching and learning policy);
  - ✓ self/peer assessment;
  - ✓ targeted questioning;
  - ✓ science homework;
  - ✓ end of unit tests;
  - ✓ mock exam sessions;
  - ✓ informal/formal examinations; and
  - ✓ B-Squared etc.

## **Impact – *What difference is the Science curriculum making on pupils?***

- The large majority of pupils meet their expected progress in Science.
- The large majority of pupils meet or exceed their expected outcomes in Science (external qualifications)

- The large majority of pupils leave Woodlane with at least one formally recognised Science qualification. Many pupils join mainstream colleges/sixth forms at post-16 where they study a range of different qualifications and subjects following excellent progress from their starting points in Science.
- Pupils are well-prepared for the next stage of their education.
- Analysis of Science outcomes and pupil progress indicates that there is some statistical significance between key groups. Where any small differences are identified strategies are implemented swiftly.
- Scientific enquiry with its broader social and ethical meaning and significance, is embedded across the school and feeds in to all subjects. Excellent progress in Science has a significant benefit for pupils in all other subjects.
- Learning science and the laws governing nature helps pupils understand our connections to the world we live in and develop as all-round individuals,
- Practical skills and life-skills are embedded in the Science curriculum and are personalised for each pupil. This supports pupils to make the leap to post-16 provision and meets their needs when entering the world of work.



## Appendix

### Science Curriculum Map – What will the pupils learn and when?

Term		Autumn A	Autumn B	Spring C	Spring D	Summer E	Summer F
Year 7 KS3		Earth and space	States of matter	Electricity	Habitats	Sound	Reproduction
Content		Movement of the Earth (day, year, seasons) the structure of our Solar system the structure of the Universe	Properties of 3 states of matter particle model changing state: melting, freezing, evaporation, condensing, sublimation Reversible and irreversible changes	Electrical appliances using electricity safely electrical circuits and diagrams how to measure electrical current	Habitats and their inhabitants adaptations of living things food chains food pyramids	How sounds are made How sound travels Volume and pitch and how they can be varied Useful applications of sound	Plant reproduction animal reproduction human reproduction
Skills	All	Identify shadows and demonstrate how they form Recall day and night follow and are regular Describe the Sun, Moon and Earth as round Recall we live on planet earth Describe simply how Earth appears from space Use a simple secondary source to collect information about a planet Recall the length of day, months and year Demonstrate using models	Sort objects by simple properties -hardness, size, shape. Describe objects in simple terms and be aware of what processes may be used on different objects – squash. Give an example of a solid, liquid and gas. Recall that water can exist in three different states of matter – solid, liquid and gas depending on temperature Describe what happens to ice at room temperature	to understand that electricity can be dangerous and learn some safety rules for handling electricity Name some everyday devices that use electricity Classify the devices as using mains electricity or batteries Recall batteries provide electricity. Examine and sort a range of batteries Identify switches and describe the effect of turning an object on or off Link together a simple circuit	Name some familiar habitats and animals found in them Identify some local habitats. Name some of the organisms that live there in the habitats Use a hand lens to observe 'minibeasts' closely Explain how to handle and return 'minibeasts' to their habitat Use simple keys to identify organisms; Recall the food source of some animals Classify animals as those	Describe sounds around them. Identify high and low sounds. Identify loud and quiet sounds. Observe how different sounds are made. Describe how sounds change over distance. Participate in an investigation to find the best material for absorbing sound. Answer questions based on their learning using prompts. Create a musical instrument that will play different	Sequence simple 4 stage lifecycles Explain plants produce seeds Match parents and offspring of familiar adults Describe where a fetus grows Explain young mammals feed on their mother's milk List some requirements for a new baby

		<p>how the earth orbits the Sun and the Moon orbits the Earth</p> <p>Explain that the Sun is a star</p> <p>Recall there are billions of stars in the universe</p>	<p>Describe what happens to water when put in a freezer.</p> <p>Name other familiar substances that can melt</p>	using matched equipment	<p>which eat plants and those which eat other animals</p>	<p>sounds.</p> <p>Identify animals that rely on their hearing</p> <p>Predict what will happen in an investigation.</p> <p>Make observations</p>	
	<b>Most</b>	<p>Explain the Earth spins on its axis and how day and night occur</p> <p>Select information from secondary sources to present a report about a planet</p> <p>recall that the Moon is a natural satellite</p> <p>Explain how we can see the Moon</p> <p>describe the differences between summer and winter in Europe</p> <p>Describe how planets, dwarf planets, asteroids and comets are arranged in the Solar system</p> <p>Produce a 3D model of the solar system</p> <p>Explain what the words constellation, galaxy, Milky Way and Universe mean</p>	<p>Describe similarities and differences between materials. Explain water comes in different forms and name each.</p> <p>Explain that a solid maintains its shape and size</p> <p>Explain that a liquid may change shape but not its volume</p> <p>Explain that a gas fills the given space and takes the shape of the whole container.</p> <p>Recognise and use the terms melting freezing condensing and evaporating.</p> <p>Investigate melting ice and factors affecting it.</p>	<p>Explain the need for safety when using electricity</p> <p>Create a simple electrical circuit using batteries, bulbs, buzzers and wires and draw a simple circuit</p> <p>Recall circuits can be series or parallel.</p> <p>Investigate which materials make switches</p> <p>Recall the circuit has to be complete for electrical devices to work</p> <p>Explain what electrical conductors and insulators are</p> <p>Describe current as a flow of electrons which transfers energy</p> <p>Set up and use an ammeter to measure current</p>	<p>Explain that green plants are the source of food for all animals</p> <p>Identify differences between different habitats and relate these to the organisms found in them.</p> <p>Describe ways in which organisms are adapted</p> <p>seasonal changes in their environment and to their mode of feeding</p> <p>Represent feeding relationships within a habitat by food chains</p> <p>Use the terms predator, prey</p> <p>carnivore or herbivore when describing an animal.</p>	<p>Explain how sound sources vibrate to make sounds.</p> <p>Explain how vibrations change when the loudness of a sound changes.</p> <p>Explain how sounds travel to reach our ears.</p> <p>Describe the pitch of a sound.</p> <p>Describe patterns between the pitch of a sound and the features of the object that made the sound.</p> <p>Explain how sound travels through a string telephone.</p> <p>Identify the best material for absorbing sound.</p> <p>Create a musical instrument that can play high, low, loud and quiet sounds.</p> <p>Identify animals that use echo location</p> <p>Make observations and draw conclusions.</p>	<p>Describe different ways seeds are dispersed</p> <p>Identify and name the main reproductive organs and describe their functions</p> <p>Describe the changes which occur during puberty</p> <p>Describe egg and sperm cells</p> <p>Explain in simple terms how fertilisation occurs</p> <p>Explain how the fetus obtains the materials it needs for growth</p> <p>Research the cost of items required for a new baby</p> <p>Describe the menstrual cycle</p>
	<b>Some</b>	<p>Describe the Sun, Earth and Moon as spherical</p> <p>Explain the position of the Sun appears to change during the day but is in fact stationary</p> <p>Recall that the Earth orbits the Sun once a year and the</p>	<p>Compare three states of matter</p> <p>Explain the meanings of the words observation, theory and prediction and give examples</p> <p>Describe some of the things that a theory about solids,</p>	<p>Represent a circuit by drawing a diagram</p> <p>Design and construct a series and a parallel circuit</p> <p>Explain how switches can be used to control an electrical device</p> <p>Demonstrate ways to vary</p>	<p>Explain why a variety of habitats is needed in a community</p> <p>Describe how different organisms contribute to the community in which they are found</p> <p>Relate food chains to energy</p>	<p>Explain how we hear and interpret sounds.</p> <p>Explain that sounds travel differently through different materials.</p> <p>Identify and explain patterns between the pitch of a sound and the features of the object</p>	<p>Explain how egg and sperm cells are specialised.</p> <p>Describe fertilisation as the fusion of two cell nuclei.</p> <p>Describe how they carry the information for development of a new life.</p> <p>Describe differences between</p>

	<p>Moon orbits the Earth once every 28 days</p> <p>Describe the effects of the Earth spinning on its axis and orbiting the Sun</p> <p>Explain that we have seasons because the Earth's axis is tilted and recall that the northern hemisphere is tilted towards the Sun in the summer</p> <p>Use a model of the Earth, Moon and Sun to explain phenomena of day and night, seasons and eclipse</p> <p>Describe some features of the Sun</p> <p>Describe some features of each planet</p> <p>Use a range of secondary sources to find information on aspects of the Solar system</p>	<p>liquids and gases should be able to explain</p> <p>Recall how the particle theory says the particles in solids, liquids and gases are arranged</p> <p>Describe how materials have different properties depending on how their particles are arranged</p> <p>Describe what diffusion is.</p> <p>Use the particle theory to explain why diffusion is faster in gases than liquids</p> <p>Explain how gases cause pressure and recall some effects of gas pressure.</p> <p>Explain the term sublimation</p>	<p>the current in a circuit to alter the brightness of the bulb</p> <p>Use conventional symbols when designing circuits</p> <p>Describe the effect of changing components within a circuit</p> <p>Explain that resistance is a way of saying how easy it is for current to flow</p> <p>Explain that some wires get hot when a current flows through them what a fuse does</p> <p>Describe the ways in which electricity can help or harm the body</p>	<p>transfer</p> <p>Describe food chains within an environment and combine these into food webs</p> <p>Use the terms producer, primary secondary and tertiary consumer when explaining a food chain or food web</p> <p>Explain how poison build up in a food chain</p>	<p>that made the sound.</p> <p>Explain how sounds change over distance.</p> <p>Explain why sounds travel better through solids than gases.</p> <p>Explain why some materials absorb sound.</p> <p>Explain how their musical instrument plays different sounds.</p> <p>Explain what ultra sounds is and describe some uses.</p> <p>Set up reliable and accurate investigations.</p> <p>Make and explain predictions.</p> <p>Make and record accurate observations.</p> <p>Use scientific language to explain their findings.</p>	<p>the gestation periods and the independence of the young of humans and other mammals</p> <p>Estimate the total cost of requirements for a new baby.</p>
<p style="text-align: center;"><b>Healthy Bodies</b></p> <p style="text-align: center;">Year 7 Pupils will study this topic throughout the year</p>						
<b>Content</b>	<p style="text-align: center;">Internal and external parts of the body</p> <p style="text-align: center;">Making healthy choices</p> <p style="text-align: center;">Effects of exercise on the body</p> <p style="text-align: center;">Microbes (germs)</p>					

		<p><b>All</b></p> <p>Name some external parts of the body.</p> <p>Suggest what is inside the body.</p> <p>state which foods they can eat lots of and which foods they can't eat lots of in the interests of health.</p> <p>Name the five senses.</p> <p>Explain which organs are associated with which sense</p> <p>Show the position of their own heart.</p> <p>Recall that the heart can beat faster.</p> <p>Recall the heart pumps blood round the body.</p> <p>Explain that skeletons are made of lots of bones.</p> <p>Describe a good dental hygiene routine</p>	<p><b>Most</b></p> <p>Explain the importance of senses for survival</p> <p>Explain we need a variety of foods to stay healthy</p> <p>Recall blood is carried around the body in tubes called blood vessels</p> <p>Explain blood carries food and oxygen to all parts of the body</p> <p>Explain that a pulse is caused by heartbeat.</p> <p>Describe the effect of exercise and rest on pulse rate.</p> <p>Explain that the skeleton is used for support, movement and protection.</p> <p>Explain that bones are joined by joints</p> <p>Explain that microbes can cause diseases</p> <p>Explain that good hygiene can prevent the spread of microbes.</p> <p>Explain good oral hygiene prevents decay.</p>	<p><b>Some</b></p> <p>Explain that food is vital for energy, growth and health.</p> <p>Explain blood is carried round the body in veins and arteries</p> <p>Explain arteries carry blood away from the heart and veins to it.</p> <p>Demonstrate how to find and count the pulse rate.</p> <p>Explain simply, why the pulse goes up with exercise.</p> <p>Name types of joints (<i>hinge, ball &amp; socket</i>)</p> <p>Explain that muscles work in pairs and can only pull.</p> <p>Name the different types of human teeth and describe the function of each</p>
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Term		Autumn A	Autumn B	Spring C	Spring D	Summer E	Summer F
Year 8 KS3		Elements and compounds	Food and Digestion	Respiration	Forces	Energy	Classification and variation
Content		Atoms and molecules Periodic table Properties and use of metals and non-metals Making compounds from elements Compounds and their formulae Chemical reactions and word equations	Structure and function of the digestive system Diet Food groups Testing for food groups Vitamin and mineral deficiencies	The respiratory system The heart Aerobic and anaerobic respiration	Contact and noncontact forces Weight and mass Motion	Energy stores Energy transfer Food and energy	Plant and animal classification Variation among species Work of Linnaeus How animals are adapted to their environment Extinct and endangered species
Skills	All	Describe some hazards when using chemicals and the safety measure they should take Describe the results of their investigation Name some common elements, compounds and mixtures Recognise some common elements by their symbol Describe how some mixtures could be separated Recognise changes of state in elements and compounds	Name the foods groups that make up a healthy balanced diet Describe how carbohydrates, protein, fibre and fats are used by the body Carry out the test for starch. Describe the effect of consuming excess fats and sugars Carry out a simple food test for fat Recall digestion begins in the mouth Name some parts of the digestive system	Name the main internal organs of the body and identify them on the human model Name and locate their heart Describe what happens to their chest as they breath Recognize that oxygen is required for respiration and is transported in the blood Describe differences between inhaled and exhaled air	Recall that push pull and twist are forces Explain forces can be measured using a force meter and the units are Newtons Recall that forces can be either contact or non-contact Recall that weight always acts downward Recall that friction opposes motion Investigate friction Identify some materials that can be stretched or compressed Investigate height and distance travelled using ramps	Recall some energy stores Recall some methods of transferring energy including by light by sound electrically Identify the stores and transfers used in some familiar devices Explain food provides the fuel we need. Recall energy resources are needed to generate electricity Explain some safety rules for using a Bunsen burner	Place a familiar animal in the correct vertebrate group. Sort familiar plants into groups Match a picture of a leaf to one on a tree Identify similarities and differences in a set of leaves Describe some adaptations animals have that enable them to survive Identify some endangered animals

	<b>Most</b>	<p>Distinguish between elements, compounds and mixtures in terms of the particles they contain</p> <p>Recognise a range of common elements by their symbols.</p> <p>Use a periodic table to identify less familiar elements by their symbol</p> <p>Explain that compounds are made when atoms of different elements join together. represent reactions in word equations</p> <p>Name and describe some common mixtures</p> <p>Suggest techniques that might be used to separate these mixtures</p> <p>Use the particle model to explain changes of state</p> <p>Identify an approach to finding out whether a material is an element or not and explain how their results provide appropriate evidence</p>	<p>Name and describe the function of parts of the digestive system Describe mechanical digestion</p> <p>Explain how digestive enzymes help to break down the food we eat</p> <p>Describe how a lack of vitamins or minerals can affect the body</p> <p>Describe and carry out the test for starch in food</p> <p>Carry out the test for sugar in food.</p>	<p>Understand the purpose of the heart and how the blood moves through the body</p> <p>Take measurements of the heart rate</p> <p>Be aware of the effects of exercise on the heart rate</p> <p>Describe the role of the blood in transporting gases to and from the lungs</p> <p>Explain why tissues need a good blood supply</p> <p>Describe aerobic respiration as a reaction with oxygen</p>	<p>Explain that air resistance slows downward motion</p> <p>Explain why some objects are more or less dense</p> <p>Describe how upthrust pushes upwards on objects in water</p> <p>Explain where and why friction can be useful</p> <p>Investigate friction created by different surfaces</p> <p>Investigate forces involved in compressing and stretching materials.</p>	<p>Name at least five energy stores including thermal kinetic chemical gravitational potential</p> <p>Recall energy is transferred electrically by heating mechanically by light by sound</p> <p>Explain energy transfers from a hot area to a colder one</p> <p>Describe how thermal insulation slows the transfer</p> <p>Explain how energy is released when fuels are burnt.</p> <p>Name a range of fuels used domestically and in industry Identify renewable and non-renewable energy resources used to generate electricity</p> <p>Compare the energy provided by different food</p>	<p>Describe the key features of some vertebrate group</p> <p>Identify some invertebrates</p> <p>Describe the lifecycle of an insect</p> <p>Give reasons for the classification of animals using examples as a guide.</p> <p>Use a key to identify an unfamiliar animal</p> <p>Identify variation within a species</p> <p>Design a creature that has a specific set of characteristics, using prompts and a word grid</p> <p>Carry out an investigation into variation within their class</p> <p>Display their results in a bar graph</p>
	<b>Some</b>	<p>Identify elements whose properties do not fit the general pattern of metals and non-metals</p> <p>Represent compounds by formulae and explain what these show about the numbers and types of atom</p>	<p>Name some enzymes in the digestive system</p> <p>Match the enzymes to the molecules they break up</p> <p>Explain how the structure of villi aids absorption</p> <p>Describe and carry the food tests for proteins</p>	<p>Recognize what may impair the functions of some of the organs</p> <p>Represent the process of aerobic respiration as a word equation</p> <p>Describe the features of alveoli and explain how</p>	<p>Explain why some objects float and others sink</p> <p>Describe weight as a combination of mass and gravity</p> <p>Explain that upthrust produced by salty water is different to fresh water</p>	<p>Explain the difference between energy stores and energy transfers</p> <p>Name all seven energy stores including magnetic and elastic potential</p> <p>Draw an energy transfer diagram to show the</p>	<p>Describe the key features of each vertebrate group</p> <p>Classify living things using the Linnaean system</p> <p>Create a key to help identify vertebrates and invertebrates</p> <p>Compare the lifecycle of different insects</p>

		<p>present</p> <p>Identify melting and boiling points as the fixed temperatures at which elements and compounds change state</p> <p>Explain their criteria for classifying materials as elements, compounds or mixtures</p>	<p>Describe and carry out a test for fats in food</p> <p>Explain what an emulsion is.</p> <p>Name an emulsifier used in the food industry</p>	<p>damaged alveoli result in less gas exchange</p> <p>Describe how chemicals are exchanged between cells and blood</p> <p>Explain when anaerobic respiration occurs and the effect on the body</p>	<p>Recall the different units for speed</p> <p>Describe how speed affects the stopping distance of a car.</p> <p>Explain the relationship between an applied force and the change of shape of an object.</p> <p>Explain how to make an experiment repeatable, fair and accurate</p>	<p>stores and transfers</p> <p>Explain how energy is transferred by conduction and radiation.</p> <p>Explain what wasted energy is and give an example.</p> <p>Describe how renewable and energy resources can be used to generate electricity and provide heating</p> <p>Investigate the energy released when different foods are burnt</p>	<p>Plan and carry out an investigation into variation within their class or year group.</p> <p>Explain the link between endangered and extinct</p>
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Term		Autumn A	Autumn B	Spring C	Spring D	Summer E	Summer F
Year 9		Key concepts in Biology Cell Structure	Acids and Alkalis	Obtaining and using materials	The nervous system	Our electricity supply	Final frontier
Content		Microscopes Understanding of size and scale in relation to microscopy, including magnification Order of magnitude calculations Plant and animal cells (structure and function of organelles) Life processes Organ systems	Safety in the Science room Acids Alkalis pH Scale Using indicators Neutralisation	The reactivity series of metals Representing reactions of metals with word and simple symbol equations Extracting metals from ores Oxidation and reduction Recycling metals. Investigating electrolysis Materials used for building	The senses and sense organs Binocular and monocular vision Central nervous system Reflex actions and receptors in the skin.	Electrical symbols and diagrams Series and Parallel circuits Circuit diagrams Electrical safety Generating and supplying electricity The National Grid Renewable and non-renewable resources Thermal insulation and energy transfer	Our Solar system and beyond Artificial and natural satellites Space travel Laws of motion Astronomy
Skills	All	Use a light microscope to view simple cells. Recall some of the seven life processes Locate the nucleus in plant and animal cells Order cells, tissues and organs by size. Name and locate major organs in the body. Describe simply the function of the kidneys	Recognise and follow the safety rules when using acids Use universal indicator and litmus paper to identify acids Recall some familiar foods are acidic (lemons oranges vinegar). Recall some rocks react with acid and some do not	Describe materials using appropriate terms including shiny, dull, strong, harder, magnetic Identify a range of objects made of metal, wood and plastic and make a collection of objects with a common property Describe objects in simple terms and talk about what objects are used for Carry out tests for hydrogen	Match the five senses with the correct sense organ Recognise that some familiar items can be identified by smell alone Identify some parts of the eye including the lid, lashes, pupil and iris Use appropriate vocabulary to describe how things feel Recall messages are sent to the brain	Name some components in a simple circuit Recognise batteries come in different sizes and provide electricity Identify some appliances that need mains electricity Recall electricity is generated in a power station	Name some of the planets on our solar system. Identify the rocky planets as those closest to the sun Compare the conditions on two planets in the Solar system Describe the sun as a star Describe the sun as a source of light Recall rockets require fuel to blast off. Recall large rockets are



				and carbon dioxide Recall concrete contains sand cement stone. Select suitable materials for a model boat			needed to put things into space. Explain the difference between manned and unmanned space travel. Recall some basic equipment required by astronauts Explain telescopes are used to view the moon and planets in space.
Most	Prepare slides of onion or cheek cells and use a light microscope to view these. Name and locate the nucleus, cytoplasm and cell membrane of a simple eukaryotic cell. Explain plant cells additionally have a cell wall Show an understanding of number, size and scale, including the use of estimations and explain when they should be used Recall the seven life processes Describe how specialised cells are adapted to their function Recall a treatment for kidney disease Explain what organ donation involves and when it may be needed.	Name some common acids and alkalis Classify solutions as acidic, alkaline or neutral, using indicators or pH values Describe what happens to the pH of a solution when it is neutralised Describe some everyday uses of acids, alkalis and neutralisation Describe the effect of acid rain on limestone marble	Sort materials according to their properties Explain why a metal is used for a certain purpose Describe the difference between conductor and insulator and relate those properties to everyday uses Describe how alloys make metals more useful Describe how metals react with acids Identify evidence which indicates that chemical reaction has taken place Represent reactions by word equations Describe changes when substances react and identify reversible and non-reversible changes Make and test a sample of concrete. Explain how varying the ratio of sand cement and stones can affect the strength of concrete.	Describe the structure and function of the eye Explain what a blind spot is Recall that the position of the eyes determines the type of vision an animal has Explain that flavour involves smell while taste is just what the tongue detects. Describe the structure of the ear and how we detect sound Recall that skin has receptors that detect pain pressure and temperature Explain the nervous system carries information to the brain	Show how to correctly connect a simple circuit Identify mains and battery-operated appliances Describe simply how electricity is generated Describe how electricity is carried via the National Grid and recognise the dangers associated with high voltages Identify some disadvantages of using fossil fuels	Name the planets in the correct order. Describe the sun as one of the stars in the Milky Way galaxy. Interpret information about planets and other bodies in the universe Explain the difference between natural and artificial satellites and give an example of each. Describe the forces acting on a rocket before it launches Recognise the volume of a gas increases when heated explain how this relates to the thrust required to launch a rocket into space. Describe how some parts of a rocket may return to earth and be reused. Recognise how light pollution and dust interfere with observation by astronomers.	

	Some	<p>Describe the difference between prokaryotic cells and eukaryotic cells</p> <p>Explain how the sub-cellular structures of cells are related to their functions,</p> <p>Demonstrate an understanding of the relationship between quantitative units in relation to cells, including milli (<math>10^{-3}</math>) micro (<math>10^{-6}</math>) nano (<math>10^{-9}</math>) and pico (<math>10^{-12}</math>)</p> <p>Describe the structure and function of the kidney</p> <p>Explain the role of ADH in water regulation</p>	<p>Explain how a neutral solution can be obtained.</p> <p>Relate the pH value of an acid or alkali to its hazards and corrosiveness</p> <p>Explain how their conclusions match the evidence obtained Suggest ways in which the data they collected could be improved</p> <p>Explain the effect of acid rain on plants and buildings</p>	<p>Recall the word equation for a neutralisation reaction</p> <p>Represent chemical compound by formulae and combine these into symbol equations</p> <p>Use knowledge of reactions to make predictions about other reactions</p> <p>Describe how acids react with metal carbonates, metal oxides and alkalis</p> <p>Use a particle theory to explain why an alloy can be stronger than the pure metal</p> <p>Explain how decisions can be reached about which metal to use when building</p> <p>Explain how rocks are formed and describe how weathering affects rocks in buildings</p>	<p>Describe how the senses of taste and smell are linked</p> <p>Describe the function of cones and rods in the retina.</p> <p>Explain how colour blindness is detected.</p> <p>Recall some common eye defects and explain how they can be corrected</p> <p>Identify the structure and function of the central nervous system</p> <p>Identify areas of skin with high and low density of receptors</p>	<p>Identify a wide range of electrical components including resistors</p> <p>Identify wires in a mains cable and describe their purpose Explain the roll of transformers in the National grid</p> <p>Calculate the amount of electricity used by different appliances and suggest how to reduce household bills</p> <p>Evaluate different forms of insulation and suggest the most cost effective method</p> <p>Compare the advantages and disadvantages of using fossil fuels to generate electricity.</p>	<p>Describe the phases of the moon and explain why they occur.</p> <p>Recall and apply Newton's First Law to explain the motion of an object moving with uniform velocity and also an object where the speed and/or direction change</p> <p>Explain why an object moving in a circle with a constant speed has a changing velocity</p> <p>Recall and apply Newton's Third law to the movement of a rocket</p> <p>Explain how the motion of the molecules in a gas is related both to its temperature and pressure</p> <p>Describe the benefits of using equipment like VLT and the Hubble telescope.</p> <p>Describe the activity of geostationary and polar orbiting satellites.</p>
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Term		Autumn A	Autumn B	Spring C	Spring D	Summer E	Summer F
Year 10 Entry level		Chemical change and rates of reactions	Control systems	CSI Plus	Motion	Genetics	Casualty
Content		Structure of the atom Atomic and mass number Isotopes The periodic table Electronic configurations Chemical bonding Metal elements and their properties Speeding up reactions	Plant and animal cells Growth and differentiation Growth in plants Enzymes Homeostasis in humans	Blood groups and DNA Collecting evidence Comparing evidence Working safely	Forces Speed and velocity Distance/time graphs Road safety Stopping distances	DNA structure Genes and alleles Genetic and environmental variation Punnett squares Genetic diagrams Effects of mutations Darwin's theory of evolution by natural selection How fossils form and about their use as evidence of evolution.	Structure and function of the respiratory system Non-communicable diseases including cardiovascular disease and asthma Healthy life-style choices
Skills	All	Recall all substances are made of atoms Identify electrons and nucleus as part of an atom Recall elements contain one type of atom Identify metal objects Identify elements as metals or non-metals according to their position in the periodic table Recall the basic safety rules followed in Science	Name and locate the nucleus, cytoplasm and cell membrane of a simple eukaryotic cell. Explain plant cells additionally have a cell wall Show an understanding of number, size and scale Recall cells divide to produce new cells Identify the roots and shoot as areas of growth in a plant. Measure the growth of a seed or bulb over several days and record the results Identify major organs in the human body Describe how our body changes when we get hot or cold	Recognise the importance of working safely in a lab Describe some safety rules specifically for working in the science room Take a set of fingerprints. Use a magnifying glass to examine a set of fingerprints Use chromatography to separate the colours in ink Recall there are different types of blood Explain our blood type is inherited from our parents	Recognise and use the appropriate vocabulary to describe motion Use a force meter to measure pushes and pulls Order objects by their speed Use arrows to indicate the strength and direction of a force Recognise the importance of road safety and describe some safety measures currently in place.	Recall that human cells contain a nucleus Recall the nucleus contains information Identify variation among their peers Carry out an investigation in to variation in hand span Identify variation within a familiar species of animal Recall off spring inherit characteristics from their parents	Recall heart pumps blood around the body Describe simply the contents of the blood Use appropriate equipment to measure pulse rate Name and locate the ribs lungs and windpipe Explain why we need to inhale and exhale Explain that exercise is an important part of a healthy life style Know how and when to call 999

	<b>Most</b>	<p>Describe the structure of an atom as a nucleus containing protons and neutrons surrounded by electrons in shells.</p> <p>Recall that when elements react their atoms join with other atoms to form compounds</p> <p>Describe the properties of metals</p> <p>Compare the reactivity of metal elements</p> <p>Explain how to increase the rate of a reaction</p>	<p>Set up and use a light microscope independently</p> <p>Recall mitosis is a form of cell division which results in an identical copy</p> <p>Describe the possible outcomes of uncontrolled cell division</p> <p>Explain percentile charts are used to monitor the growth of babies</p> <p>Describe the role of enzymes in the digestive system</p> <p>Recall some ways in which the body controls the internal environment including sweating and micturition.</p>	<p>Recall anyone at a crime scene will leave some evidence</p> <p>Explain some methods used to collect and store evidence</p> <p>Describe the clothing worn by CSIs</p> <p>Explain why CSIs wear special clothing</p> <p>Collect some fingerprints from a surface</p> <p>Match a feature in a fingerprint with an example</p> <p>Compare ink samples separated by chromatography</p> <p>Recall DNA is found inside our cells</p>	<p>Calculate resultant force from balanced and unbalanced forces</p> <p>Describe the advantages and disadvantages of friction</p> <p>Explain how friction can be reduced</p> <p>Recognise relative speeds for everyday contexts such as walking, running, cycling, for a car and for an airplane.</p> <p>Explain stopping distance is a combination of thinking distance and breaking distance</p>	<p>Explain how variation in characteristics can be inherited environmental or both</p> <p>Recall the nucleus contains DNA Recall DNA contains chromosomes</p> <p>Model the structure of DNA using pipe cleaners</p> <p>Explain sex is determined at fertilisation</p> <p>Explain how x and y chromosomes determine the sex of a baby</p> <p>Recall some organisms are better suited to their environment and these are more likely to survive and bred</p> <p>Explain what antibiotics are used for</p>	<p>Recall arteries carry blood away from the heart and veins carry blood towards the heart</p> <p>Explain the importance of maintaining a supply of oxygen to the body</p> <p>Carry out a test for carbon dioxide using limewater</p> <p>Explain the immediate effect of exercise on the body</p> <p>Explain the longer-term effects of regular exercise</p> <p>Describe some risk factors associated with an increased risk of heart disease</p>
	<b>Some</b>	<p>Recall that most of the mass of an atom is concentrated in the nucleus</p> <p>Explain atoms have no overall charge because they contain equal numbers of protons and electrons</p> <p>Recall the meaning of the term mass number of an atom</p> <p>Calculate the numbers of protons, neutrons and electrons in atoms when given the atomic number</p>	<p>Explain the limitations of light microscopy</p> <p>Record the growth of a seed or bulb and display the results in a graph.</p> <p>Describe growth in organisms, including: cell division, elongation and differentiation in plants</p> <p>Describe the division of a cell by mitosis as the production of two daughter cells, each with identical sets of chromosomes</p>	<p>Describe how CSIs collect and store fingerprints for evidence Identify some features of fingerprints including loop, arch and whorl</p> <p>Demonstrate ways to collect evidence without contaminating or mixing it up</p> <p>Name the main blood groups</p> <p>Recall identical twins have identical DNA but otherwise our DNA is unique</p> <p>Interpret data from a crime</p>	<p>Explain the difference between speed and velocity</p> <p>Use the equation <math>\text{Speed} = \text{distance}/\text{time}</math> to calculate average speeds</p> <p>Calculate stopping distances</p> <p>Interpret time distance graphs Explain acceleration as a change in speed</p> <p>Recognise acceleration can have a positive or negative value</p>	<p>Explain normal body cells have 46 chromosomes</p> <p>Explain females have 23 pairs (including XX) and males have 22 pairs and one odd pair (XY).</p> <p>Use simple Punnett squares to show possible genotypes.</p> <p>Explain some genes are dominant and some are recessive.</p> <p>Explain some diseases are caused by faulty genes</p> <p>Explain embryos can be</p>	<p>Describe the differences in the structure of veins and arteries</p> <p>Explain how red blood cells are adapted to their function</p> <p>Explain how limewater can be used to test for carbon dioxide</p> <p>Investigate the relationship between height and peak flow</p> <p>Describe the effect on the body of major blood loss</p> <p>Describe the actions taken by</p>

		<p>and mass number.</p> <p>Recall that graphite and diamond are different forms of carbon and that they are examples of giant covalent substances.</p> <p>Identify patterns of reactivity in Alkali metals.</p>	<p>Describe the role of enzymes using the lock and key model</p> <p>Explain how the body controls its internal temperature and water levels</p>	<p>scene and decide whether or not it confirms a suspect's presence</p>		<p>tested for certain genes.</p> <p>Discuss the ethical implications of genetic screening</p> <p>Explain Darwin's theory of evolution by natural selection</p> <p>Explain how fossils form and about their use as evidence of evolution</p>	<p>a first aider to reduce blood loss</p> <p>Describe the symptoms of asthma and some treatments used</p>
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Term		Autumn A	Autumn B	Spring C	Spring D	Summer E	Summer F
Year 10 GCSE		Chemical change and rates of reaction	Control systems	1. CSI plus 2. Fuels	Motion	Genetics	Casualty
Content		Structure of the atom Atomic mass Atomic and mass number Isotopes The periodic table Electronic configurations Ionic bonding. Ionic lattices Covalent bonding Simple molecular and giant covalent substances Metals and metallic bonding	Mitosis Growth and differentiation Enzymes and nutrition Enzyme action Enzyme activity Homeostasis in humans	1. Blood groups and DNA Collecting evidence Comparing evidence Chemical analysis Working safely  2. Extracting and using crude oil Fractional distillation Hydrocarbon chains	Speed and velocity Some typical speeds Acceleration equation and units Distance/time graphs Stopping distance Reaction time	DNA structure. Genes and alleles Genetic and environmental variation Meiosis and mitosis Monohybrid inheritance: Punnett squares Genetic diagrams Selective breeding Genetic engineering Ethical implications Darwin's theory of evolution by natural selection How fossils form and about their use as evidence of evolution.	Structure and function of the respiratory system Non-communicable diseases including cardiovascular disease and asthma Healthy life-style choices
Skills	All	Describe the structure of an atom as a nucleus containing protons and neutrons surrounded by electrons in shells. Recall that most of the mass of an atom is concentrated in the nucleus Recall that an ion is an atom or group of atoms with a positive or negative charge. Describe the properties of ionic compounds including melting points and boiling points Describe the conductivity of ionic compounds as solids,	Set and use a light microscope independently Explain the limitations of light microscopy Accurately measure the growth of a seed or bulb and record the results in a graph. Describe the division of a cell by mitosis as the production of two daughter cells, each with identical sets of chromosomes in the nucleus to the parent cell Explain how this results in the formation of two genetically identical cells	<u>CSI</u> Recall anyone at a crime scene will leave some evidence Explain some methods used to collect and store evidence Describe the clothing worn by CSIs Explain why CSIs wear special clothing Collect some fingerprints from a surface Match a feature in a fingerprint with an example Compare ink samples separated by chromatography Recall DNA is found inside the nucleus of our cells	Identify balanced unbalanced and resultant forces Describe the advantages and disadvantages of friction Recognise relative speeds for everyday contexts such as walking, running, cycling, for a car and for an airplane. Use the equation $\text{Speed} = \frac{\text{distance}}{\text{time}}$ to calculate average speeds Explain why we have speed limits on the road Explain stopping distance is a combination of thinking distance and breaking	Classify a range of human features as genetic, environmental or both Recall chromosomes are made of DNA and our DNA carries our unique genetic code. Describe the structure of DNA as a double helix Recall some organisms are better suited to their environment and these are more likely to survive and breed Recognise fossils are evidence of organisms which lived long ago.	Explain the benefits of good life style choices Explain the immediate effect of exercise on the body Explain how red blood cells are adapted to their function Explain how limewater can be used to test for carbon dioxide Describe the process of gas exchange in the lungs Explain how smoking interferes with the function of the lungs Describe the symptoms of asthma and treatments used

		<p>when molten and in aqueous solution.</p> <p>Describe the properties of metals including alkali metals</p> <p>Recall that graphite and diamond are different forms of carbon</p>	<p>Demonstrate an understanding of the relationship between quantitative units in relation to cells</p> <p>Describe the possible outcomes of uncontrolled cell division</p> <p>Describe the role of enzymes in the digestive system</p> <p>Recall some ways in which the body controls the internal environment including sweating and micturition.</p>	<p><b><u>Fuels</u></b></p> <p>Describe crude oil as a dark sticky toxic substance</p> <p>Recall some fractions of crude oil and their uses</p> <p>Use Molymods to show the structure of simple hydrocarbons</p> <p>Give an advantage and a disadvantage of using petrol and diesel for transport</p> <p>Recall hydrocarbons are composed of hydrogen and carbon</p>	<p>distance</p> <p>Identify factors affecting stopping distances</p>	<p>Describe some of the animals Darwin encountered and the variations he observed</p>	
<b>Most</b>		<p>Recall the relative charge and relative mass of a proton, a neutron and an electron.</p> <p>Explain why atoms contain equal numbers of protons and electrons</p> <p>Calculate the numbers of protons, neutrons and electrons in atoms given the atomic number and mass number.</p> <p>Explain how ionic bonds are formed by the transfer of electrons between atoms to produce cations and anions, including the use of dot and cross diagrams.</p> <p>Explain the formation of simple molecular, covalent substances,</p> <p>Compare the properties of giant covalent compounds, including melting and boiling points and conductivity</p> <p>Recall that graphite and diamond are examples of</p>	<p>Describe the stages in mitosis as interphase, prophase, metaphase, anaphase telophase and cytokinesis</p> <p>Describe growth in organisms, including: cell division, elongation and differentiation in plants</p> <p>Describe the function of embryonic stem cells, stem cells in animals and meristems in plants</p> <p>Discuss the potential benefits and risks associated with the use of stem cells in medicine</p> <p>Use a percentile chart to identify issues in the development of a child over time.</p> <p>Describe the role of enzymes using the lock and key model</p> <p>Explain how the body controls its internal temperature</p>	<p><b><u>CSI</u></b></p> <p>Describe how CSIs collect and store fingerprints for evidence</p> <p>Identify some features of fingerprints including loop, arch and whorl</p> <p>Demonstrate ways to collect evidence without contaminating or mixing it up</p> <p>Name the main blood groups</p> <p>Recall identical twins have identical DNA but otherwise our DNA is unique</p> <p>Interpret data from a crime scene and decide whether or not it confirms a suspect's presence.</p> <p><b><u>Fuels</u></b></p> <p>Recall crude oil is mainly made up of hydrocarbons in chains of varying lengths</p> <p>Describe fractional distillation as a method of separating crude oil. Recall the fractions of crude oil and their uses</p> <p>Recall some fuels ignite more</p>	<p>Explain the difference between speed and velocity</p> <p>Explain how speed distance and time are related</p> <p>Manipulate the equation <math>\text{Speed} = \text{distance}/\text{time}</math> and use it calculate the unknown value</p> <p>Calculate stopping distances</p> <p>Interpret time/distance graphs and use them to calculate speed</p> <p>Recall large acceleration means large speed changes, small times or both</p> <p>Explain why acceleration can have a positive or negative value</p>	<p>Recall that normal body cells have 46 chromosomes females have 23 pairs (including XX) males have 22 pairs and one odd pair (XY).</p> <p>use simple Punnett squares to show possible genotypes</p> <p>Explain how some diseases are caused by faulty genes</p> <p>Discuss the ethical implications of genetic screening</p> <p>Describe the process of selective breeding</p> <p>Explain Darwin's theory of evolution by natural selection</p> <p>Describe an alternative theory and explain how it has been disproved.</p>	<p>Describe the function of the different chambers of the heart</p> <p>Explain why alveoli are efficient at exchanging gases</p> <p>Investigate the relationship between height and peak flow</p> <p>Identify anomalous results</p> <p>Investigate surface area to volume ratio</p> <p>Describe the effect on the body of major blood loss</p> <p>Describe the actions taken by a first aider to reduce blood loss</p> <p>Describe some methods of treating cardiovascular disease</p>

	giant covalent substances. Identify patterns of reactivity in Alkali metals.	blood sugar levels and water levels	easily than others and relate this to their uses. Label the equipment used to find out which fuel is most efficient Interpret data and decide which fuel releases the most energy when the same amount burns			
Some	<p>Explain how the existence of isotopes results in relative atomic masses of some elements not being whole numbers.</p> <p>Describe the limitations of particular representations and models to, include dot and cross, ball and stick models and two- and three-dimensional representations</p> <p>Explain, in terms of structure and bonding, why graphite is used to make electrodes and as a lubricant, whereas diamond is used in cutting tools.</p> <p>Explain the properties of fullerenes including C60 and graphene in terms of their structures and bonding</p> <p>Explain the patterns of reactivity in two different groups in the periodic table</p>	<p>Explain the difference between adult and embryonic stem cells</p> <p>Describe the ethical implication of the use of embryonic stem cells</p> <p>Explain how percentile charts are developed and used to monitor development</p> <p>Describe the limitation in the use of percentiles to monitor development within a population</p> <p>Describe how enzymes breakdown large molecules</p> <p>Investigate the action of enzymes</p>	<p><u>CSI</u></p> <p>Name the human blood groups</p> <p>Explain blood can be rhesus positive or negative and this is an inherited characteristic.</p> <p>Use simple chemical analysis techniques to identify unknown metal compounds.</p> <p>Describe simply techniques used to match samples of DNA.</p> <p>Extract and interpret information from charts and tables</p> <p>Select and use appropriate apparatus, techniques and magnification, including microscopes, to make observations of biological specimens</p> <p><u>Fuels</u></p> <p>Use <math>C_nH_{2n+2}</math> to calculate the number of hydrogen atoms in a simple hydrocarbon</p> <p>Identify fractions by their boiling point</p> <p>Plan and carry out an investigation into the efficiency of different fuels</p> <p>Interpret information about the use of different fuels</p>	<p>Draw and interpret time distance graphs</p> <p>Draw and interpret time/speed graphs</p> <p>Relate acceleration to the gradient on a speed-time graph</p> <p>Use the equation acceleration = change in speed/time taken.</p> <p>Define uniform acceleration and use gravity as an example</p> <p>Explain that acceleration is proportional to the resultant force.</p> <p>Use the equation <math>F=ma</math> to calculate resultant force.</p> <p>Manipulate the equation <math>F=ma</math> and calculate the value of the mass or acceleration</p>	<p>Explain how overuse of antibiotics can lead to antibiotic resistant bacteria.</p> <p>Use a punnet square to predict the likelihood of inheriting dominant and recessive genetic diseases</p> <p>Explain how neonatal screening is used to detect some genetic diseases</p> <p>Compare the differing views people have about genetic screening</p> <p>Describe some of the obstacles Darwin faced when presenting his theory.</p>	<p>Describe the sequence of contractions and valve openings as blood passes through the heart</p> <p>Describe the substances transported in plasma</p> <p>Describe how haemoglobin transports oxygen through the blood</p> <p>Use surface area to volume ratio to explain how red blood cells are adapted to their function</p> <p>Compare the advantages and disadvantages of methods used to treat cardiovascular disease</p>



Term		Autumn A	Autumn B	Spring C	Spring D	Summer E	Summer F
Year 11 Entry level		Plant structures and their functions.	Health, disease and the development of medicines	Metals and acids	Methods of separating and purifying substances	Electromagnetic Spectrum	Science in Action
Content		<p>The leaf and photosynthesis Factors affecting photosynthesis The structure of plants cells including root hair and palisade cells Diffusion and osmosis Plants for food</p> <p>Pupils will complete an Entry Level Certificate practical task.</p>	<p>Types of pathogens Spreading pathogens Physical and chemical defences Communicable and non-communicable diseases The immune system Antibiotics The effect of lifestyle factors on non-communicable diseases BMI and waist-to-hip ratio calculations Cardiovascular disease</p>	<p>The reactivity series of metals Properties and uses of metals The pH scale Metals and acids The test for hydrogen gas Electrolysis Recycling metals</p>	<p>Mixtures Methods of separating. Filtration, evaporation and crystallisation Paper chromatography Interpret a paper chromatogram Distillation</p>	<p>Frequency, wavelength and amplitude Longitudinal and transverse waves. Light and the electromagnetic spectrum Radio waves, microwaves, infrared, visible, ultraviolet, X-rays and gamma rays Uses and dangers of electromagnetic radiation</p>	<p>First aid Health and Safety The role of science and scientists Science in the news Gathering evidence from reliable sources</p>
Skills	All	<p>Recall that plants undertake photosynthesis Recall the word equation for photosynthesis Identify the leaves as the site of photosynthesis Describe how lack of water affects plants Describe the path water takes through a plant from the roots to the leaves Describe how the direction of light can affect a plant Investigate the process of osmosis with support Identify plants we eat</p>	<p>Recall microbes can make us ill Recall bacteria viruses and fungi are microbes Explain how coughing and sneezing can spread microbes Recall good hygiene can reduce the spread of microbes Recall being overweight is bad for your health Recall exercise and a healthy balanced diet are good for us.</p>	<p>Describe the properties of metals Carry out investigations to demonstrate the properties of metals Investigate the comparative reactivity of metals with support Identify hazard warnings on containers and follow safety advice Recall that a neutral solution has a pH of 7 and that acidic solutions have lower pH values and alkaline solutions higher pH values.</p>	<p>Recall a mixture contains two or more substances Set up and use a range of equipment safely Select appropriate equipment to sieve, decant and filter mixtures Explain that some solids dissolve and some do not Separate colours in a dye using chromatography</p>	<p>Recall the colours of the spectrum Recall some forms of radiation that make up the EMS Explain that exposure to UV can be dangerous. Describe some ways to reduce the risks of exposure to UV Describe the advantages and disadvantages of using x-rays</p>	<p>Recognise when first aid may be required Use simple techniques to promote their own and others safety Identify science topics in news articles Formulate questions to put to scientist to help understand the work they carry out.</p>

<b>Most</b>	<p>Set up and use a light microscope to view stomata</p> <p>Describe the structure and function of the stomata</p> <p>Recall that the rate of photosynthesis is affected by light intensity</p> <p>Describe an investigation used to demonstrate the effects of light intensity</p> <p>Investigate the process of osmosis</p> <p>Explain osmosis involves the movement of water molecules</p> <p>Identify the edible parts of a plant.</p>	<p>Explain microbes are tiny organisms</p> <p>Recall viruses, bacteria and fungi are types of microbes</p> <p>Name some common diseases caused by microbes</p> <p>Describe some physical and chemical barriers the body has to defend against microbes</p> <p>Explain how good hygiene reduces the spread of microbes.</p> <p>Prepare agar plates under supervision.</p>	<p>Recall that most metals are extracted from ores found in the Earth's crust</p> <p>Recall that unreactive metals are found in the Earth's crust as the uncombined elements</p> <p>Evaluate the advantages of recycling metals, including economic implications and how recycling can preserve both the environment and the supply of valuable raw materials</p> <p>Describe the use of hazard symbols on containers to indicate the dangers associated with the contents and to inform people about safe-working precautions with these substances in the laboratory</p>	<p>Recall a mixture contains two or more substances that are not chemically combined</p> <p>Describe solids as soluble or insoluble</p> <p>Describe techniques used to separate mixtures including crystallisation, distillation</p> <p>Use chromatography to distinguish between pure and impure substances</p> <p>Use chromatography to compare known and unknown substances</p> <p>Explain where our drinking water comes from</p> <p>Sequence the stages in the treatment of drinking water</p>	<p>Arrange the colours of the spectrum in the correct order</p> <p>Label the wave length on a diagram of a wave</p> <p>Describe how UV can damage our health.</p> <p>Identify the most effective forms of sun protection.</p> <p>Describe the benefits of using infrared, microwaves, radio waves and gamma rays</p> <p>Describe the hazards associated with microwaves, infrared and gamma rays</p>	<p>Describe basic emergency first aid techniques including controlling bleeding, recovery position and treatment for shock</p> <p>Describe ways of ensuring their own and others safety</p> <p>Compare the science in articles from different sources</p> <p>Reference their sources of information</p> <p>Describe how science is involved in a wide range of jobs</p>
<b>Some</b>	<p>Recall photosynthesis as a reaction that uses light energy to react carbon dioxide and water to produce glucose and oxygen</p> <p>Recall the chemical equation for photosynthesis and compare it to respiration.</p> <p>Describe how the large surface area of the root hair cells helps them to absorb water and mineral ions from the soil</p> <p>Describe the process of diffusion as the movement of particles from an area of higher concentration to an area of lower concentration</p> <p>Describe the process of osmosis</p> <p>Describe some methods used to increase crop yields.</p>	<p>Recall the WHO definition of health</p> <p>Describe the structure of a virus and bacterium</p> <p>Describe how white blood cells help to fight infections</p> <p>Calculate BMI from given values and identify the category it falls in</p> <p>Explain the difference between communicable and non-communicable diseases.</p> <p>Describe immunisation as a way of improving immunity</p> <p>Describe aseptic techniques</p>	<p>Recall that acids in solution are sources of hydrogen ions</p> <p>Recall that the extraction of metals involves reduction of ores</p> <p>Explain why the method used to extract a metal from its ore is related to its position in the reactivity series and the cost of the extraction process</p> <p>Explain how to safely test for hydrogen</p> <p>Explain how to safely test for carbon dioxide</p>	<p>Explain how evaporating a solvent slowly results in larger crystals</p> <p>Predict which liquid will evaporate first when a mixture is distilled</p> <p>Describe how waste water and ground water can be made drinkable including the need for filtration and chlorination</p> <p>Describe electrolysis as a process which uses electricity to decompose ionic compounds</p> <p>Recall the products formed during the electrolysis of some electrolytes including copper sulphate and water acidified with <math>\text{H}_2\text{SO}_4</math></p>	<p>Describe a wave using wavelength frequency and amplitude</p> <p>Explain how wavelength determines the order of the colours of the spectrum.</p> <p>Explain the difference between UVA and UVB</p> <p>Explain how the danger posed by a form of radiation is linked to its frequency</p> <p>Recall unstable atoms can emit alpha or beta particles or gamma rays</p>	<p>Explain the theory behind basic first aid techniques</p> <p>Explain when and how to use hands only CPR</p> <p>Evaluate the validity of science in news articles and advertisements</p> <p>Recognise reliable sources for advice on safety</p> <p>Describe the science skills needed to carry out a range of jobs</p>

Term		Autumn A	Autumn B	Spring C	Spring D	Summer E	Summer F
Year 11 GCSE		Plant structures and their functions. Transport in plants	Health, disease and the development of medicines	Metals and acids	Animal coordination, control and homeostasis	Ecosystems and material cycles	Revision and exams
Content		<p>The leaf and photosynthesis</p> <p>Factors affecting photosynthesis</p> <p>Rate of photosynthesis</p> <p>The structure of the root hair cells</p> <p>Diffusion, osmosis and active transport</p> <p>The structure of xylem and phloem tubes</p> <p>Transpiration and translocation</p>	<p>Types of pathogens</p> <p>Spreading pathogens</p> <p>Physical and chemical defences</p> <p>Communicable and non-communicable diseases</p> <p>The immune system</p> <p>Antibiotics</p> <p>The effect of lifestyle factors on non-communicable diseases</p> <p>BMI and waist-to-hip ratio calculations</p> <p>Cardiovascular disease</p>	<p>The reactivity series of metals</p> <p>Properties and uses of metals</p> <p>The pH scale</p> <p>Metals and acids</p> <p>The test for hydrogen gas</p> <p>Electrolysis</p> <p>Recycling metals</p>	<p>Homeostasis</p> <p>The endocrine system</p> <p>Hormonal control of blood glucose</p> <p>Causes and methods used to control Type 1 and Type 2 diabetes.</p> <p>Correlation between body mass and type 2 diabetes</p> <p>Hormonal and barrier methods of contraception</p>	<p>Populations, communities and ecosystem</p> <p>Abiotic and biotic factors</p> <p>Interdependence and its importance in a community</p> <p>The impact of humans on biodiversity</p> <p>How data from samples can be used to estimate population sizes</p> <p>The importance of water, carbon and nitrogen cycles</p>	
Skills	All	<p>Recall that plants and green algae are organisms that undertake photosynthesis</p> <p>Describe photosynthetic organisms as the main producers of food</p> <p>Recall photosynthesis as a reaction that uses light energy to react carbon dioxide and water to produce glucose and oxygen</p> <p>Describe the process of diffusion as the movement of particles from an area of higher concentration to an area of lower concentration</p> <p>Describe the process of</p>	<p>Recall 3 types of microbes</p> <p>Explain the difference between communicable and non-communicable diseases</p> <p>Give example of communicable and non-communicable diseases</p> <p>Describe some preventative measures used to avoid communicable diseases</p> <p>Describe treatments for cardiovascular disease</p> <p>Calculate BMI and explain which category the individual falls in</p> <p>Describe immunisation as a way of improving immunity</p>	<p>Describe the use of hazard symbols on containers to indicate the dangers associated with the contents and to inform people about safe-working practices</p> <p>Investigate and compare the reactivity of metals</p> <p>Recall that a neutral solution has a pH of 7 and that acidic solutions have lower pH values and alkaline solutions higher pH values.</p> <p>Recall that most metals are extracted from ores found in the Earth's crust</p> <p>Recall unreactive metals are</p>	<p>Recall the body needs to maintain a constant internal environment including temperature, blood glucose and water levels.</p> <p>Explain the role of the skin in thermoregulation</p> <p>Explain the role of the kidneys in controlling water levels</p> <p>Identify where hormones are produced</p> <p>Name some hormones and describe their effect on the body</p> <p>Sequence the stages in the menstrual cycle</p>	<p>State what is meant by the ecological terms community, population and a habitat.</p> <p>Name an example of each</p> <p>Explain how communities can be affected by other organisms through competition for resources or predation</p> <p>Recall that a community often survives because organisms within it depend on each other and this is known as interdependence</p> <p>Explain why water is important to living</p>	

	<p>osmosis as the movement of water molecules from an area of higher concentration to an area of lower concentration across a semi-permeable membrane</p> <p>Investigate the effect of light intensity on the rate of photosynthesis</p> <p>Investigate osmosis in plant cells</p>	<p>Describe aseptic techniques. Prepare agar plates under supervision</p>	<p>found in the Earth's crust as the uncombined elements</p>		<p>organisms</p> <p>Annotate a diagram of the water cycle</p> <p>Describe the effect of increasing human population on food security</p> <p>Describe methods for investigating the number of organisms in a given area, including by using quadrats and pitfall-traps</p>	
<b>Most</b>	<p>Describe how leaves are adapted to carry out photosynthesis and gas exchange efficiently</p> <p>Describe the transport of water and mineral ions up the stem of a plant from the roots through the xylem</p> <p>Describe the process of transpiration and the factors effecting it</p> <p>Recall that sugar is transported around the plant in the phloem</p> <p>Compare the structure of phloem and xylem cells</p> <p>Recall that diffusion, osmosis and active transport are all used to move substances across a cell membrane into a cell</p> <p>Describe and carry out an investigation which demonstrates the effect of light intensity on the rate of photosynthesis</p> <p>Describe and carry out an investigation in to osmosis in plant cells</p> <p>Identify methods used to</p>	<p>Explain the WHO definition of health</p> <p>Explain the difference between a virus and bacterium using diagrams</p> <p>Explain the difference between antibiotics and antiseptics</p> <p>Describe how antibiotics may be effective across a wide spectrum or against specific bacteria.</p> <p>Explain how immunisation can improve immunity</p> <p>Describe the stages in the development of new medicines</p> <p>Evaluate the benefits of using BMI and waist to hip ratios.</p> <p>Evaluate some common treatments for cardiovascular disease</p>	<p>Describe a neutralisation reaction as a reaction between an acid and a base</p> <p>Recall acids in solution are a source of hydrogen ions</p> <p>Evaluate the advantages of recycling metals, including economic implications and how recycling can preserve both the environment and the supply of valuable raw materials</p> <p>Recall that the extraction of metals involves reduction of ores</p> <p>Explain why the method used to extract a metal from its ore is related to its position in the reactivity series and the cost of the extraction process.</p> <p>Describe the environmental impact of extracting metal ores</p>	<p>Explain the principle of homeostasis as a process</p> <p>Describe the structure and function of the kidneys</p> <p>Explain what causes hormones to be released</p> <p>Describe how hormones are transported from endocrine glands to their target organs.</p> <p>Explain why the pituitary gland is known as the master gland. Describe the effect of adrenaline on the body</p> <p>Explain the roles of the hormones oestrogen and progesterone in the control of the menstrual cycle</p> <p>Explain how the hormone insulin controls blood glucose concentration</p> <p>Explain the causes of type 1 and type 2 diabetes and how they are controlled</p>	<p>Define the term conservation</p> <p>Give examples of animal conservation</p> <p>Recall the benefits of reforestation, including providing a habitat for organisms, increasing biodiversity and reducing the effects of climate change</p> <p>Describe the effect of new pests and pathogens on food security</p> <p>Describe the importance of the carbon cycle, including: carbon dioxide entering the atmosphere through respiration or combustion, carbon dioxide leaving the atmosphere through photosynthesis and the role of microorganisms as decomposers</p> <p>Label a simplified diagram of the nitrogen cycle</p> <p>Investigate population size using a quadrat</p>	

		increase crop yields					
	Some	<p>Describe active transport as a process that uses energy to move a substance from an area of lower concentration to an area of higher concentration</p> <p>Explain where this occurs in a plant</p> <p>Evaluate an investigation into osmosis in plant cells</p> <p>Describe the role of auxins in the growth and development of a plant</p> <p>Describe some commercial uses of plant hormones</p>	<p>Explain how antigens trigger an immune response</p> <p>Evaluate the arguments for and against immunisation.</p> <p>Describe some uses of monoclonal antibodies including pregnancy testing and cancer treatments.</p> <p>Describe the physical and chemical defences used by plants</p> <p>Name some plant based chemicals used in medicine</p>	<p>Explain the terms dilute and concentrated, with respect to amount of substances in solution.</p> <p>Explain the terms weak and strong acids, with respect to the degree of dissociation into ions</p> <p>Explain the general reactions of aqueous solutions of acids with:</p> <p>metals</p> <p>metal oxides</p> <p>metal hydroxides</p> <p>metal carbonates to produce salts.</p> <p>Describe how to carry out an acid-alkali titration, using burette, pipette and a suitable indicator, to prepare a pure, dry salt</p>	<p>Compare and contrast neurones and hormones</p> <p>Explain how hormonal contraception influences the menstrual cycle and prevents pregnancy</p> <p>Explain the mechanism and the significance in negative feedback. Evaluate the correlation between body mass and type 2 diabetes including BMI and waist: hip ratio</p>	<p>Explain how animal conservation can affect biodiversity</p> <p>Explain how reforestation can benefit biodiversity</p> <p>Explain how drinking water can be produced by desalination in areas of drought</p> <p>Describe how nitrogen is recycled in the nitrogen cycle</p> <p>Explain how farmers increase nitrates in soil</p> <p>Explain the use of belt transects to investigate distribution.</p>	