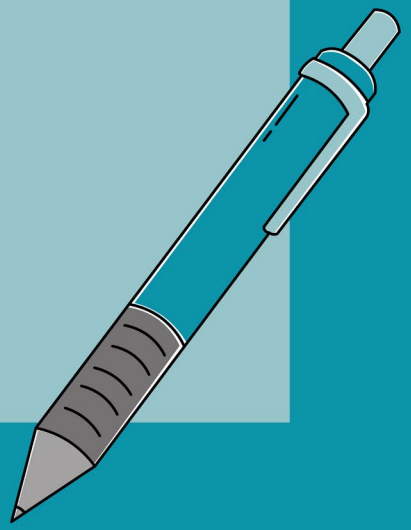
MANCHESTER COMMUNICATION ACADEMY

SCIENCE CURRICULUM OVERVIEW

Manchester Communication Academy



WITH YOU...FOR YOU...ABOUT YOU...

The Science curriculum

The science curriculum is based on pillars of knowledge that deepen in complexity of declarative and procedural knowledge over time. The three disciplines of biology, chemistry and physics are sequenced ensuring new knowledge builds on prior knowledge of scientific concepts. The pillars of knowledge underpinning the curriculum are: Biology: cells, genetics, organisms and their environment, variation and health. Chemistry: substances and properties, particles and structure, chemical reactions, earth chemistry and dynamic earth. Physics: particles and matter, forces and motion, electricity, magnetism and energy. Threshold concepts act as hinge points in the KS3 curriculum to check understanding of knowledge. A text rich curriculum is a highlight of the science curriculum especially in year 9 where all learning is linked to extracts of 'The Martian' book.

Assessment in the Science curriculum

At the end of each topic at KS3, students complete a ‘threshold concept’ extended writing piece which is linked to the big ideas running through the curriculum. Students’ self assess their work against clearly defined criteria that deepen in complexity throughout the curriculum. Baseline assessments are carried out on entry to year 7 which check understanding of KS2 knowledge allowing for curriculum adaptations to take place where necessary. Throughout KS3, three summative assessments are carried out through out the year which are used to close gaps in knowledge and inform curriculum adaptations. At KS4, summative assessments take place at the end of autumn 2 to determine progress within the GCSE. Students complete GCSE paper 1 for biology, chemistry and physics (covering half the GCSE content) in summer 2. In year 11, students complete a full suite of GCSE papers at the beginning of autumn 2 and end of spring 1. In year 11 students complete a weekly assessment targeting one topic a week with a focus on independent and effective revision strategies.

Year 7 Science curriculum

Autumn overview

Year 7	Autumn 1	Autumn 1	Autumn 2	Autumn 2
Topic name	Science fundamentals	Matter	Energy	Humans
Declarative knowledge	Units for mass, volume, temperature, distance and time. Equipment used to take these measurements. Choosing the most appropriate piece of equipment. Hazard symbols and associated safety precautions. Defining the terms independent, dependent, control variables and hypothesis. Why we repeat investigations.	Particle model. Properties of solids, liquids and gases. Changes of state. Boiling and evaporating. Chemical and physical changes. Conservation of mass. Brownian motion. A simple atomic model. Everything on the earth is made of the elements on the periodic table.	Energy stores and transfers. Units for energy (J). Energy in food. Energy in our home. Fossil fuels. Renewable and non-renewable energy resources. Ways we can reduce energy use in our homes. Insulators. Energy in fuels. How can we reduce energy bills in our home.	Healthy diets. Diffusion in the digestive system. Malnutrition and obesity. Organs and organ systems. Circulatory and respiratory system. Asthma and smoking.
Procedural knowledge	Taking measurements. Recording and presenting results in a tables and graphs. Selecting the appropriate piece of equipment to take a measurement. Identifying hazards in an investigation. Identifying variables in an investigation. Calculating a mean from a set of data. Describing trends in results. Testing hypotheses and making predictions. Devising a method for an investigation.	Drawing particle diagrams. Identifying atomic symbols of elements on the periodic table. Put methods into order. Write predictions and record observations.	Measuring the temperature of water. Calculating a temperature change. Identify control variables. Devise a method. Follow a method. Suggest improvements to a method. Write a conclusion from results.	Calculating Kcal in food. Heart dissection. Devising methods for investigations. Measuring heart rate and breathing rate.

Outcomes/Assessment	Baseline assessment. Big test – summative assessment.	Extended writing (threshold concept) – Can oxygen be a liquid? Big test – summative assessment.	Big test – summative assessment.	Extended writing (threshold concept) - Why do humans need to eat a healthy diet and exercise? Little test - Key piece assessment. Big test – summative assessment.
Prior knowledge	KS2 – Planning an investigation to answer questions. Controlling variables. Carrying out investigations with support. Taking measurements, recording results, presenting data and making predictions. Repeating readings when appropriate. Writing conclusions.	KS2 - Some materials change state when heated or cooled (e.g. water). Materials can be grouped together based on the state. Substances can react together. Y7 Fundamentals - Mass, volume and temperature (equipment used to measure and units).	KS2 - The idea of food and fuel for energy. Y7 Matter - different states have different energy levels and the energy needed to change state. Y7 Fundamentals - Measurements of temperature, mass and volume using appropriate equipment. Variables. Methods. Conclusions.	KS2 - Humans cannot make their own food. Parts of the digestive system, circulatory system and respiratory system. Recognising the effect of diet, exercise and drugs on how their bodies function.

Future learning	The fundamentals in this scheme of learning will be applied in practical investigations throughout the curriculum.	Melting and boiling points of pure and impure substances. Heating and cooling curves. Separation techniques. Chemical reactions. Using the periodic table to calculate the number of protons, neutrons and electrons.	Energy requirements in a healthy diet. Energy transfers by electricity and by waves. Describing energy transfers. Exothermic and endothermic reactions. Conservation of energy. Specific heat capacity and specific latent heat. Work done and power.	Digestive enzymes. Role of glucose in respiration. Flow of blood through the heart. Role of blood in respiration.
Why is this being studied?	National curriculum. It is essential student have these skills secure so that the procedural knowledge can be applied in novel investigations throughout the curriculum.	National curriculum. Students need to have a secure understanding of the particle model and states of matter, as this is a basis for lots of deeper learning around particles and matter in the Chemistry and Physics curriculum.	National curriculum. Energy underpins many concepts across biology, chemistry and physics. It is important for students to have a secure understanding of energy stores and transfers to build on. Understanding energy use in our homes and ways we can reduce energy use and bills helps students make better choices in their future.	National curriculum. Importance of healthy diets and exercise in living a healthy lifestyle. The harmful effects of smoking.

Spring overview

Year 7	Spring 1	Spring 1	Spring 2
Topic name	Movement in Manchester	Manchester Scientists	Mixtures and separation
Declarative knowledge	Units for force. Equipment to measure a force. Name forces such as friction, weight and thrust. The effects of forces on an object. Contact and non-contact forces. Balanced and unbalanced force. Resultant force. Friction and ways to reduce friction. Units for speed, distance, time, and the equipment to measure these quantities. Distance-time graphs. Units and equipment to measure mass and weight. Extension and elastic.	Structure of the atom. How the periodic table is organised. Properties of metals and non-metals. Atomic symbol, atomic number and mass number of elements. The formula of common compounds. Reactants and products in a chemical reaction.	Pure substances and mixtures. Soluble and insoluble substances. The definition of solute, solvent and solution. Temperature can affect how much solute will dissolve in a solvent. The purpose of filtration, evaporation, distillation and chromatography. The boiling point of water. Dangers of not having safe drinking water.
Procedural knowledge	Measure forces using a force meter. Draw arrows to represent the size and direction of forces. Identify the forces acting in a situation. Categorise forces into contact and non-contact. Calculate resultant forces from diagrams. Follow a method. Record data in a table. Suggest control variables. Write a conclusion. Identify when an object is stationary and moving at a constant speed on a distance time graph. Calculate speed. Calculate weight. Measure the extension of a spring.	Draw and label an atom. Describe trends in data. Predict the melting and boiling point of a substance using the trend in data. Calculate the number of protons, neutrons and electrons in an atom. Identify the element when given the atomic symbol. Identify the elements in a compound when given the formula. Write word equations for a reaction.	Identify the solute and solvent in a solution. Draw and label the equipment for filtration and evaporation. Carry out filtration and evaporation. Identify risks and safety precautions. List the steps of a method in the correct order. Write a conclusion. Identify which liquid boils first during distillation. Use a thermometer to measure temperature. Set up paper chromatography. Identify pure substances and mixtures from a chromatogram.

Outcomes/Assessment	Key piece assessment – little test.	Extended writing (threshold concept) – Is there anything smaller than an atom?	Summative test – big test.
Prior knowledge	KS2 - Naming and categorising forces. Forces affect motion or shape of objects. The effects of air resistance, water resistance and friction. KS3 – Units and pieces of equipment to measure mass, distance and time. Selecting appropriate pieces of equipment. Defining independent, dependent and control variables. Identifying independent and dependent variables. Using variables to write methods for investigations. Recording, presenting and describing data in an investigation. Calculating a mean from a set of data.	KS3 - Everything is made up of atoms. Periodic Table is a list of all known elements on the Earth. Differences between atoms, elements and compounds. Chemical reaction makes new substances.	KS2 - Knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Some substances will dissolve in a liquid to form a solution. Melting and dissolving are different processes. KS3 - Units and equipment for mass and temperature. Hazards and safety precautions. Chemical and physical changes. Elements are made up of one type of atom only.

Future learning	KS3 - Density and pressure. Movement (muscles and bones). Electricity. Magnetism. Earth and space. Weight on other planets. KS4 - Forces and motion. Density. Particle model. Work done and power. Electricity. Magnetism and electromagnetism.	Y8 - Word equations for biological reactions. KS4 - Electronic configuration. Mendeleev's periodic table. Properties and reactivity of group 1, 7 and 0 elements. Predicting trends in melting point, boiling point and density.	Chemical reactions. Temperature changes in chemical reactions. Y9 - Deeper learning of separation techniques. Explaining the steps of the methods for filtration, crystallisation, chromatography and distillation. Calculate Rf value in chromatography. Fractional distillation. Heating and cooling curves for pure substances and mixtures. Producing potable water. KS4 - Neutralisation reactions. Producing a pure dry salt. Extracting DNA from fruit. Insoluble and soluble salts.
Why is this being studied?	National curriculum. Forces and motion underpins future topics in KS3 such as density and pressure, electricity and magnetism, earth and space. This scheme of learning builds on KS2 forces and motion and science fundamentals studies in Y7. Students will apply procedural knowledge of taking measurements, recording and presenting data.	National curriculum. The structure of the atom and how to use the periodic table underpins many other chemistry topics. Students need a secure level of understanding of the periodic table, what it is and why chemists use it. There are trends and patterns in the periodic table; it is the chemist's way of organising chemical knowledge. Students need to be confident with this before studying topics such as acids and alkalis, metals and chemical reactions in Y8 as well as biological reactions in Y7.	National curriculum. Students need a secure understanding of pure substances, mixtures, soluble and insoluble substances and how we can separate them to apply this later in the curriculum. Students will develop their skills of drawing and labelling scientific equipment which will be used throughout the curriculum.

Summer overview

Year 7	Summer 1	Summer 1	Summer 2
Topic name	Density and pressure	Cells	Biological processes
Declarative knowledge	Definition of density, mass and volume. Units for density, mass and volume. Density of solids, liquids and gases. The anomaly of ice and water in terms of density. The density of water is $1g/cm^3$. Define pressure. Units for pressure. Pressure depends on force and area. Pressure in fluids.	Hierarchy from cell to organism. Humans are multicellular organisms. Cells are bigger than atoms and cells are made of atoms. Subcellular structures in plant and animal cells and the functions. Ciliated epithelial cells (specialised cells). Bacteria are unicellular organisms. Subcellular structures in a bacterial cell. Diffusion. Difference in concentration. Oxygen and glucose diffuse into cells from the blood. Oxygen and glucose are needed for cells to release energy. Function of lenses and focusing wheels on a light microscope.	Factors that affect the growth of a plant. Water and mineral ions enter through the roots of a plant. Photosynthesis including the word equation. Chloroplasts and mitochondria. Explain why plants are essential for human life. The journey of an oxygen molecule from plant to human cell. Osmosis. Aerobic and anaerobic respiration including the word equations. Fermentation.
Procedural knowledge	Measuring using a ruler. Calculating volume of a cube. Measuring mass using a balance. Calculating density. Follow a method to investigate density of irregular objects and liquids. Measure the volume of a liquid and volume of an irregular object using a measuring cylinder (change in volume of water). Record data in a table. Predict the density of liquid from concentration. Write a conclusion from results. Calculate weight. Calculate pressure.	Compare and contrasts the subcellular structures in plant and animal cells. Label the parts of a light microscope. Follow a method to prepare a microscope slide. Use a light microscope to focus on a specimen. Draw animal and plant cells and label the subcellular structures from a microscope observation.	Design an experiment to investigate plant growth. Identify control variables in an investigation. Devise a method to investigate the effect of light intensity on plant growth. Record data in a table. Identify the reactants and products of photosynthesis and respiration. Suggest why heart rate increases with exercise intensity. Describe trends in data.

Outcomes/Assessment	Big test – summative assessment.	Small test – key piece assessment.	Small test – key piece assessment.
Prior knowledge	KS2 – Grouping materials into solids, liquids and gases. Calculating area. Y7 - States of matter and particle arrangement. Mass and volume. Forces. Taking and recording measurements.	KS2 – Identify whether things are alive, dead or have never lived. How living things are classified according to common observable characteristics, similarities and differences, including microorganisms, plants and animals. Y7 – everything is made up of atoms, including cells. Organs and organ systems. Digestive system and the role of the large surface area of the intestines. Diffusion. Oxygen is an element and glucose is a compound.	KS2 – Plants need water, light and suitable temperature to grow. Water transport within plants. Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Y7 - Reactants and products in a chemical reaction. Energy is transferred by light. Diffusion in the respiratory and digestive system. Sub-cellular structures found in plant, animals and bacteria.

Future learning	Y9 – Investigating the effect of area on pressure. Measuring density to identify unknown substances (comparing to reference data). KS4 – Particle model. Forces and matter. States of matter and separation techniques. Investigating water.	Y8 - Functions of chloroplasts and mitochondria. Photosynthesis and respiration and their link to the cell. Specialised cells in reproduction. KS4 – Mitosis and meiosis. Neurones as specialised cells. Light and electron microscopes. Magnification calculations. Investigating respiration and photosynthesis. Exchange and transport in animals.	Y8 – Chemical reactions. Y9 - Use of a respirometer to investigate the rate of respiration in small organisms. Explain why some cells have more mitochondria than others do. Not all bacteria have flagella. KS4 - Investigating respiration and photosynthesis. Exchange and transport in animals. Exothermic and endothermic reactions. Function of stomata in gas exchange in the plant. Function of xylem and phloem in the transport of water, mineral ions and glucose in a plant. Investigating the effect of sucrose concentration on the process of osmosis.
Why is this being studied?	National curriculum. This scheme of learning builds on prior Y7 knowledge of the particle model and the quantities of mass and volume. Students will apply procedural knowledge of taking measurements, recording and presenting data, as well as carrying out calculations when given quantities.	National curriculum. This scheme of learning introduces students to the concept that the cell is the basic structural and functional unit of all life from which all organisms emerge. Students will build on their knowledge of humans, organs and organ systems to understand the structure and function of cells and sub cellular structures. Students need to have a secure understanding of cells, as they will build on this throughout the biology curriculum when learning	National curriculum. Students now build on their knowledge of cells, humans, plants and chemical reactions to look at the biological processes of photosynthesis and respiration. It is essential students have a secure understanding of these processes to build on this when students learn about plant structures and functions, gas exchange and transport of substances in plants and animals.

		about concepts such as cell division, cancer, respiration and photosynthesis.	

Year 8 Science curriculum

Autumn overview

Year 8	Autumn 1	Autumn 1	Autumn 2	Autumn 2	Autumn 2
Topic name	Science fundamentals 2	Reproduction	Acids and alkalis	Periodic table	Waves and sound
Declarative knowledge	Units for mass, volume, distance, temperature and force. Equipment used to take these measurements. Name the equipment used for evaporation. Hazard symbols and associated safety precautions. Defining the terms independent, dependent, control variables and hypothesis. Why we repeat experiments.	Structure and function of the male and female reproductive system in humans. The importance of the menstrual cycle for reproduction. Human gametes. Adaptations of the sperm and egg cell for reproduction. Definitions of reproduction, fertilisation, gestation, embryo and foetus. The function of the placenta and umbilical cord. Effects of maternal lifestyle on developing foetus. Reproduction in plants. Pollination. Importance of bees for food production.	Hazard symbols. Hazards and risks. Safety precautions. Acids, alkalis and neutral solutions. pH scale. Indicators. Neutralisation reaction.	Mendeleev's periodic table. The modern periodic table. Names of the groups in the periodic table and some properties of these elements. The physical and chemical properties of alkali metals including reactivity.	Examples of waves. Waves transfer energy and information but not matter. Amplitude, wavelength and frequency of waves including units. Pitch is the frequency of sound waves. Sound waves. Speed of sound in air. Dangers and precautions for sound waves. How we hear. Waves can reflected, absorbed or transmitted. Echo and echolocation. Water waves.

Procedural knowledge	Converting km into m. Taking measurements. Recording and presenting results in a tables and graphs. Drawing the equipment set up for evaporation. Selecting the appropriate piece of equipment to take a measurement. Identifying hazards in an investigation. Identifying variables in an investigation. Calculating a mean from a set of data and rounding answers to a certain number of decimal places or significant figures. Describing trends in results. Identify data points from a graph. Testing hypotheses. Devise a method for an investigation including control variables. Calculate a percentage of a number using a calculator.	Label a diagram of a female and male reproductive system. Dissect and identify parts of a flower. Record data in a table. Evaluate data and identify sources of error.	Write word equations for neutralisation reactions. Name and label the equipment used in an acid-alkali titration. List the steps of a method in the correct order. Calculate a mean from results obtained. Write a conclusion for the experiment. Evaluate the risks of specific practical's.	Identify the group an element is in. Compare Mendeleev's periodic table and the modern periodic table.	Label amplitude, wavelength, peaks and troughs on a wave diagram. Identify how many wavelengths there are in a diagram of a wave. Identify high pitch and low pitch sounds from wave diagrams. Compare human frequency range to animals (bats, dolphins, dogs).
Outcomes/Assessment	Summative test – big test.	Summative test – big test.	Key piece – small test.	Key piece – small test.	Key piece – small test.

Prior knowledge	Y7 science fundamentals - Units for quantities. Equipment used to take measurements. Hazard symbols and associated safety precautions. Defining the terms independent, dependent, control variables and hypothesis. Taking measurements. Recording and presenting results in a tables and graphs. Selecting the appropriate piece of equipment to take a measurement. Identifying hazards in an investigation. Identifying variables in an investigation. Calculating a mean from a set of data. Describing trends in results. Testing hypotheses.	KS2 – Life process of reproduction in some plants and animals. Differences in the life cycles of a mammal, amphibian, insect and bird. The length of gestation in humans. Living things produce offspring of the same kind but not identical to parents. Y7 – Subcellular structures in plant and animal cells including mitochondria for respiration.	KS2 – Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. Y7 - hazard symbols. Using equipment to take measurements.	Y7 – Each element has its own symbol, atomic number and mass number. Metals are on the left and non- metals are on the right of the periodic table. Common properties of metals and non-metals.	KS2 - Sounds are caused by vibrations; they travel through a medium to the ear. Different vibrations cause different sounds Y7 - Key terms Pressure, Density Y7 - Matter, particle arrangement of solids liquids and gases. Y7 - Energy can be transferred between stores.
Future learning	The fundamentals in this scheme of learning will be applied in practical investigations	Menstrual cycle and hormones. Mitosis and Meiosis. Specialised cells. Feeding a growing population.	Y8 - Chemical Reactions - What observations can you see during a chemical reaction?	Y9 - What the group and period number tell you about an atom.	Y8 – Describing energy transfers. KS4 – Waves and the electromagnetic

	throughout the curriculum.		KS4 - Chemical Changes, Neutralisation produces water due to the H+ and OH- reacting together. Photosynthesis core practical – hydrocarbonate indicator is used to detect small pH changes. Carbon dioxide is acidic. Metal oxides are bases used in neutralisation.	KS4 – Structure of the atom. Daltons atomic model. Protons, neutrons, electrons. Isotopes. Structure of the atom determines position in the periodic table. Electronic configuration. Ionic and covalent bonding. Calculations involving masses.	spectrum. Conservation of energy. Particle model. Photosynthesis – energy transferred by light. Exothermic and endothermic reactions – energy transfer.
Why is this being studied?	National curriculum. This is an opportunity to retrieve and then build on the science fundamentals studied at the start of Y7. It is essential student have these skills secure so that the procedural knowledge can be applied in novel investigations and this supports the learning of new declarative knowledge throughout the curriculum.	National curriculum. This builds on learning of humans and cells to look at how organisms reproduce and the specialised cells involved. In KS4 students will build on this by learning how cells divide by mitosis for growth and repair, how stem cells differentiate and how sex cells are produced by meiosis.	National curriculum. This scheme of learning introduces students to acids and alkalis, particularly focusing on pH and using indicators, this gives students a solid foundation for the investigation of chemical properties and chemical reactions later in the curriculum. Students will apply their knowledge of hazards	National curriculum. This builds on the introduction to the periodic table in Y7 where students learn how to navigate the periodic table in terms of chemical symbols to represent elements and how the periodic table is organised. In this scheme students will compare the modern periodic table to Mendeleev's periodic table to see how it has	National curriculum. Students will apply their prior knowledge of the particle model and energy transfers to new learning that sound waves transfer energy and information to allow us to communicate. Understanding waves is essential for later schemes of learning such as light.

			and safety precautions.	developed with scientific discoveries.	

Spring overview

Year 8	Spring 1	Spring 1	Spring 2	Spring 2
Topic name	Celebrating Manchester's diversity	The Earth	Metals	Electricity
Declarative knowledge	Genetic and environmental variation. Continuous and discontinuous variation. Evolution and natural selection. The importance of peer review. Extinction. Discovery of DNA. DNA has a double helix structure. Heredity and examples of inherited traits. Genes and chromosomes. Gene banks and biodiversity.	Structure of the earth. Fossils can be found in different layers of the earth. Older fossils are found in deeper layers of rock. How scientific theories are formed. The formation of igneous, sedimentary and metamorphic rocks. The rock cycle. Composition of the Earth's atmosphere. The carbon cycle. Greenhouse gases. The greenhouse effect. Global warming. Climate change.	Particle arrangement in a solid metal. Common properties and uses of metals and non-metals. Reactivity series. How to test the reactivity of metals. Reactivity of metals with acid, water and oxygen using the reactivity series. Extraction of metals. Properties and uses of ceramics, glass and polymers. Finite resources. Recycling.	Static electricity in insulating materials. Like-charges repel and opposite charges attract. Current and potential difference, including units and components used to measure. Conditions needed for current to flow in a circuit. Resistance opposes current. Units for resistance. How changing potential difference changes current and resistance. Series and parallel circuits. Electrical hazards. Fuses break a circuit.
Procedural knowledge	Interpret bar charts and histograms. Devise a method to extract DNA from fruit. Identify control variable for an investigation. Identify the	Make a prediction about the results of a scientific investigation. Describe patterns in data. Describe the pattern of carbon	Drawing particle arrangements. Write the word equation for a metal reacting with acid, oxygen or water. Independent, dependent and control variables in a metal and acid reaction	Calculate current from potential difference and resistance. Draw circuit diagrams. Identify components and their position in a circuit. Follow a method to build a test circuit. Identify the

	equipment needed for filtration.	dioxide levels and global temperature.	experiment. The order of metal reactivity based on observations in the lab. Evaluate a method and suggest improvements.	independent, dependent and control variables. Write a conclusion from results using data.
Outcomes/Assessment	Extended writing (threshold concept) - How do animals evolve over time? Why do brothers and sisters look similar but not identical?	Extended writing (threshold concept) - How is the Earth and its atmosphere structured?	Big test - summative assessment	Big test – summative assessment
Prior knowledge	KS2 - living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. Living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. Animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. Y7 – DNA is stored in the nucleus of cells. Reproduction in humans. Filtration to separate mixtures.	KS2 - compare and group together different kinds of rocks based on their appearance and simple physical properties. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soils are made from rocks and organic matter. Y7 - Non-renewable resources release CO_2. Differences between atoms, elements and compounds. Pure substances.	KS2 - Distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Describe the simple physical properties of a variety of everyday materials. Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Y7 - The properties of metals and non-metals. Particle	KS2 - The brightness of a lamp or the volume of a buzzer depends on the number and voltage of cells used in the circuit. Circuit symbols. Switches open and close a circuit. A lamp will light if switch is closed. Conductors and insulators. Metals are good conductors. Identify common appliances that run on electricity. Construct a simple series electrical circuit. Y7 – Atomic model. Atoms and the periodic table. Conductors and insulators to reduce energy transfers. Non-contact forces. Y8 – Metals.

			arrangement of solids. Representing chemical reactions using formulae and using equations. Y8 - The structure of the earth.	
Future learning	KS4 - Variation comes from mutations in DNA and sexual reproduction (meiosis and inheritance of alleles). Stages of natural selection. Antibiotic resistance being evidence for natural selection. Human fossils and stone tools as evidence for human evolution. Genetic engineering. Structure of DNA. Extracting DNA from fruit – application of knowledge and explaining different parts of the method. Genetic diagrams to explain inheritance of genetic conditions.	Y8 – Metals and their uses. Y9 - Compare and contrast the Earth's atmosphere with Mars's atmosphere. KS4 - Fuels and Earth Science – crude oil is extracted from the ground. Renewable and non-renewable resources. Fossils as evidence for evolution. Carbon cycle.	KS4 – Fuels and earth science including crude oil. Properties of materials based on structure. Extracting metals using heating with carbon or electrolysis depending on the metals position in the reactivity series. Life cycle assessments and recycling. Writing word, balanced, ionic and half equations.	Y8 – Energy transfers. Magnetism. KS4 – Conservation of energy. Electricity. Magnetism and electromagnetism. Electrolysis. Metallic structure.
Why is this being studied?	National curriculum. This builds on students' knowledge of humans and reproduction by introducing the concept of genetic information being passed	National curriculum. This builds on student's knowledge of the formation of fossils and fossil fuels as non-renewable energy	National curriculum. This builds on students' knowledge of particle arrangement, acids and alkalis and the periodic table and the structure of the Earth. Students	National curriculum. This builds on students KS2 knowledge of circuit symbols, building simple circuits and insulators and conductors. Students will also link new

	down from one generation of organisms to another. Students will learn about the process of evolution. Students will build on this in KS4 with how bacteria become resistant to antibiotics and genetic engineering.	resources. Students will learn about the formation of rocks, the carbon cycle, the Earth's structure and atmosphere and climate change. This helps students understand our impact on the environment.	will apply their knowledge of carrying out investigations safely, with control variables and recording results. Students will be able to link their prior knowledge of our impact on the environment to ways we can reduce impact by recycling. Students will build on this in KS4 when learning about how we can extract metals using heating with carbon or electrolysis and metallic bonding.	learning to their knowledge of metals and non-contact forces from earlier in KS3. Students will learn about current, potential difference, resistance and electrical safety. They will apply their procedural knowledge of investigations. Students will build on this in KS4 with electromagnetism and electrolysis.

Summer overview

Year 8	Summer 1	Summer 1	Summer 2	Summer 2
Topic name	Magnetism	Improving Manchester's health	Light	Chemical reactions
Declarative knowledge	Magnetism is a non-contact force. Not all metals are magnetic. The three magnetic metals. Attraction and repulsion. Shape of a magnetic field around a bar magnetic. The Earth's magnetic field. Current through a wire produces a	WHO definition of health. Pathogens. Prevalence of diseases in our community. How to prevent transmission of diseases. The effects of recreational drugs and ways to stop people taking them. Antibiotics are used to kill	Light travels in straight lines away from the source. Luminous objects. Absorption, reflection and transmission. Compare light and sound waves. Pinhole cameras. Reflection including how mirrors and rough surfaces reflect light. Light speeds up or slows down when it hits a new medium	Physical and chemical changes. Observations to show a chemical reaction is happening. In a chemical reaction, atoms are rearranged to make something new. Combustion. The test for carbon dioxide. Displacement reactions. Endothermic and exothermic

	magnetic field. Uses of magnets and electromagnets. Current carrying wires are electromagnets. When an electromagnet is placed a magnetic field we get movement (motor).	bacteria. Vaccines. The cause and treatments of type 1 and type 2 diabetes.	depending on density. Lenses. White light is made up of all of the colours of the spectrum. Cells in the eye detect light.	reactions. Catalysts. Catalytic converters in cars.
Procedural knowledge	Follow a method to investigate electromagnets. Make a prediction. Record data in a table. Write a conclusion from data collected.	Describe trends in data. Form an opinion on a controversial topic.	Draw a simple ray diagram for a single luminous object and an eye. Draw a ray diagram to show how a pinhole. camera forms an image. Use ray diagram to show that light is absorbed by opaque objects. Follow a method to investigate the law of reflection. Record data in a table. Write a conclusion. Label a ray diagram to show an incident ray and refracted ray. Label the different parts of the eye and parts of a camera. Match parts of eye and camera in terms of role.	Write word equations for given chemical reactions including combustion, thermal decomposition and displacement. Identify the independent, dependent and control variables in an experiment. Record results in table. Calculate a mean. Write a conclusion using data to explain results. Use a thermometer to measure the start and end temperature of a reaction. Calculate temperature change. Identify whether a reaction is endothermic or exothermic based on temperature change.
Outcomes/Assessment	Big test – summative assessment.	Extended writing - Why do we need to educate the local community in living a healthy lifestyle?	Extended writing - Why do people wear glasses? When I'm stood in sunlight why do I begin to feel warmer?	Extended writing – why are new products formed in a chemical reaction?
Prior knowledge	KS2 - Properties of materials including their response to a magnet. Magnetic forces act at a distance. Magnets attract and repel. Group materials	Y7 - the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Healthy human diet. Effects of smoking.	KS2 - light travels in straight lines. How objects are seen. How shadows are formed. Patterns in the way that the size of shadows changes.	KS2 - some changes result in the formation of new materials, and that this kind of change is not usually reversible e.g. burning

	together based on if they are attracted to a magnet. Magnets have two poles. Predict whether magnets will attract or repel. Y7 – Non-contact forces. Properties of metals and non-metals.	Effects of obesity, starvation and malnutrition. Bacteria are unicellular organisms. Cells. Bacteria are involved in digestion in humans. Types of pathogens.	Light is needed to see things. Dark is the absence of light. Light is reflected from surfaces. Light from the sun can be dangerous and that there are ways to protect our eyes. Y7 – Energy transferred by light. Photosynthesis. Y8- Waves transfer energy.	and the action of acid on bicarbonate of soda. Y7 – Definition of a chemical reaction and taking observations of chemical reactions. Measuring temperature using a thermometer. Acids, Alkalis, and indicators. Digestive enzymes break down food.
Future learning	KS4 – Forces and their effects. Magnetism and the motor effect. Electromagnetism.	KS4 – Pathogens. Immune response. The body's response to a vaccination. Antibiotic resistance in bacteria. Cardiovascular diseases and treatments. Blood glucose regulation. Regulation of metabolic rate. The correlation between BMI and type 2 diabetes.	Y8 – Describing energy transfers. KS4 – Waves, light and the electromagnetic spectrum. Photosynthesis.	Y9 – Combustion. KS4 – Obtaining metals. Displacement reactions. Reactivity of groups in the periodic table. Complete and incomplete combustion. Photosynthesis and respiration. Enzymes as biological catalysts. Catalysts. Factors effecting the rate of reactions. Endothermic and exothermic reactions.

Why is this being studied?	National curriculum. Students will build on their prior knowledge of magnetic forces and electric current. They will learn that current through a wire causes a magnetic field around the wire and we call this an electromagnet. Students will learn the uses of electromagnets and investigate how the strength of an electromagnet can be changed.	National curriculum. This scheme of learning is building students' knowledge that organisms must stay in good health to survive and thrive. This scheme of learning goes beyond the national curriculum to allow student to gain an understanding of diseases that are prevalent in our local community. Health and disease education is essential to try to improve health in the local area.	National curriculum. This scheme of learning is building on students' prior knowledge of energy transfers and transverse waves in KS3. Students will develop their understanding of energy being transferred by light and how light behaves when interacting with different surfaces and mediums.	National curriculum. This scheme of learning is building students' knowledge of chemical reactions. It is important for students to know that when substances react, atoms are rearranged and new substances form but mass is always conserved.

Year 8	Summer 2	Summer 2	Summer 2
Topic name	Energy	Movement	Ecosystems
Declarative knowledge	Energy stores (elastic potential and nuclear). Waves transfer energy including light, radiation and vibrating particles. Forces and electricity can transfer energy. Energy can be wasted. Quantities needed to determine GPE.	The skeleton provides support, protection, movement and makes blood cells. Flexible joints allow movement. The structure and function of the skull, ribcage and backbone. Antagonistic muscles working in pairs. Function of tendons, ligaments and cartilage. Muscle cells have many mitochondria for respiration. The locomotor system. Contracted muscles exert a force on bones for movement.	Ecosystems are made of the non-living and living things in an environment. Biodiversity and maintaining biodiversity. Interdependence. Importance of insects. Effects of humans on ecosystems. Poisons can be transferred through the food chain. Toxic materials can impact and move through an ecosystem.
Procedural knowledge	Use a flow diagram to show changes in the way energy is stored when a system changes. Identify useful and wasted energy transfers in a situation. Calculate from word problems useful, wasted and total input energy. Identify missing values using a Sankey diagram. Choose the most appropriate piece of equipment. Write a method. Evaluate results. Write a conclusion.	Measure the force exerted by a muscle using a Newton meter. Follow a method to investigate how muscle size effects number of bicep curls completed. Write a hypothesis. Record data in a table. Describe trends in data. Evaluate an investigation.	Label a food web with predator, prey, producer, primary consumer, secondary consumer. Interpret a food web. Predict what will happen to a community of organisms if the population of an organism changes. Interpret a pyramid of numbers and pyramid of biomass. Use a quadrat for sampling. Estimate the number of organisms in an area. Calculate area. Calculate a mean. Enter results into a table. Set up a pitfall trap for sampling.
Outcomes/Assessment	Extended writing (threshold concept) – Energy cannot be created or destroyed.	Extended writing (threshold concept) – How does our skeleton protect our organs? How do our arms and legs move?	Extended writing (threshold concept) – Why is it important to maintain biodiversity? Why are big fierce creatures rare?
Prior knowledge	KS2 – food and fuel for energy. Y7 – States of matter have different energy levels. Energy to change state.	KS2 – Humans and other animals have skeletons for support, protection and movement.	KS2 - most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and

	Energy cannot be created destroyed. Energy stores. Energy is transferred between stores and some can be wasted. Insulation. Renewable and non-renewable energy resources.	Y7 – Function of the mitochondria is respiration. Measuring forces.	plants, and how they depend on each other. Name a variety of plants and animals in their habitats, including microhabitats. Construct and interpret a variety of food chains, identifying producers, predators and prey. How animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.
Future learning	KS4 – Conservation of energy. Waves and the EM spectrum. Forces and their effects. Electricity. Particle model and energy to change state. Specific heat capacity and specific latent heat.	Y9 – Circulatory system. KS4 – Stem cells. Forces and motion. Respiration and the heart.	Y9 – Structure of an ecosystem including biotic and abiotic factors. Impact of non-indigenous species. KS4 – Parasitic and mutualistic relationships in ecosystems. Use quadrats to estimate population size (random sampling) and investigate distribution of organisms (belt transect). Impact of fish farms and eutrophication on ecosystems. Water, carbon and nitrogen cycle.
Why is this being studied?	National curriculum	National curriculum.	National curriculum.

Year 9 Science curriculum

Autumn overview

Year 9	Autumn 1 and 2	Autumn 1 and 2	Autumn 1 and 2
Topic name	The Martian Biology	The Martian Chemistry	The Martian Physics
Declarative knowledge	Compare aerobic and anaerobic respiration including word equations. Where aerobic respiration happens in a cell. Describe how a respirometer works.	Define mass number and atomic number in terms of protons and neutrons. The equipment needed for filtration and crystallisation. Describe when filtration and crystallisation would be used. Definitions for separation mixtures e.g. solution, soluble and insoluble. How to obtain a dry salt sample - going on from evaporation to crystallisation.	Weight is a force caused by gravity and is measured in N. Describe how to measure the speed of sound in air. State the typical speed of sound in air. State the quantities that need to be measured for a speed equation.
Procedural knowledge	The equipment used to measure and control temperature. Devise a method for any experiment. Explain why experiments are repeated. Identify hazards and suggest ways to minimise risk in an experiment. Record data in a table. Describe trends in data. Use a respirometer to generate data. Identify independent, dependent and control variables in an experiment. Calculate a mean with rounding numbers, and significant figures.s	Identify the atomic number and mass number for elements, using these to calculate numbers of protons, neutrons and electrons. Use the periodic table to find information on group number, period number, metal or non-metal, atomic symbol, atomic number and mass number. Draw the equipment set up, using the correct equipment symbols, for filtration and crystallisation.	Calculating weight with conversions between g and kg. Giving answers to a specified number of decimal places. Giving answers in standard form. Applying the equation for speed including conversions between SI units. ICHEW strategy for equations. Devise a method for measuring speed in the lab/playground. Method strategy: Equation, Measurements, How will you measure? Calculate. Choose appropriate equipment to measure length. Identify on a d/t graph: constant speed, no motion. Compare speeds qualitatively. Determine from a d-t graph the distance covered after a certain time or time it took to cover a certain distance

			Predict the value of data points from trends in data.
Outcomes/Assessment	Mixed key piece assessment AU1 – small test. Biology summative assessment AU2 – big test.	Mixed key piece assessment AU1 – small test. Chemistry summative assessment AU2 – big test.	Mixed key piece assessment AU1 – small test. Physics summative assessment AU2 – big test.
Prior knowledge	Y7 cells - Parts of animal and plant cells. Y8 Biological reactions - Word equations for aerobic and anaerobic respiration. Y8 chemical reactions – word equations (reactants and products). Fundamentals Y7 and Y8 units for quantities e.g. mass, volume, temperature, time and distance. Equipment used to take measurements. Hazard symbols and safety precautions. Defining the terms independent, dependent, control variables. Taking simple measurements, recording and presenting results. Selecting pieces of equipment for a measurement. Identifying hazards in an investigation. Identifying variables in an investigation. Calculating a mean from a set of data. Describing trends in results.	Y7 atoms and the periodic table - The periodic table is a list of all of the known elements. Elements on the periodic table are ordered by increasing atomic number. Elements are arranged in periods and groups, with metals on the left and non-metals on the right. Atoms are made up of 3 subatomic particles – protons, neutrons and electrons and contains a nucleus in the middle. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution (KS2) Mass is measured in grams using a balance (Science Fundamentals SoL Y7) Temperature is measured in °C using a thermometer (Science Fundamentals SoL Y7) Law of conservation of mass (Matter SoL Y7)	Y7 forces and motion – forces as pushes or pulls. Equipment needed to measure a force. Effect of forces on an object. Contact and non-contact forces Weight is a force caused by gravity and measured in N. The equation for calculating weight and the equipment used for measuring force and mass. SI units and equipment needed to measure distance and time. Simple speed calculations. Motion graphs – stationary object and object moving at a constant speed. Steeper line = higher speed.

Future learning	How our body cells get the oxygen and glucose they needs for respiration. How our heart gets the energy, it needs to beat. How our circulatory system is designed to transport reactants and products of respiration and digestion, blood cells and hormones around the body. Photosynthesis. Investigate the effect of temperature on the rate of respiration in mealworms (core practical). Investigate how the type of organism affects the rate of respiration. Diffusion, osmosis and active transport. The procedural knowledge in this SOL will be applied throughout the curriculum to a range of new contexts to support the learning and application new declarative knowledge.	Atomic structure and bonding. Groups in the periodic table in terms of chemical properties and reactivity. Explaining why an element is in a group and periodic linked to atomic structure. Electronic configuration. Separating mixtures using chromatography, distillation and fractional distillation.	Conversion and rounding skills applied to all calculations. Using standard form in a range of calculations. Forces and motion - Why do we need to use standard units? Prefixes: G, M, k, m, μ, n, p, Describing vector and scalar quantities, rearrangement of equations. Typical speeds wind and sound, and for walking, running, cycling and other transportation systems. Measure speed accurately – specifically speed of sound and trolley in a lab. Explain and analyse Distance – Time Graphs. Newton's laws to explain the effect of force on motion. Acceleration – calculations and how to measure. Velocity time graphs.
Why is this being studied?	National curriculum. It is essential student have these skills secure so that the procedural knowledge can be applied in novel investigations.	National curriculum. It is essential that students are competent using the periodic table and understanding protons, neutrons and electrons to explain covalent and ionic bonding, electronic configuration and explaining the chemical properties and reactivity of elements in different groups.	National curriculum. It is essential students are competent carrying out calculations using the ICHEW strategy and describing how to determine a quantity so this can be applied to a range of contexts throughout the curriculum. As well as conversions back to SI units and rounding to a particular number of significant figures and decimal places.

Spring overview

Year 9	Spring 1 and 2	Spring 1 and 2	Spring 1 and 2
Topic name	Biology - What do we need to survive?	Chemistry - States of matter and separating mixtures	Physics - Forces and motion
Declarative knowledge	Cells and specialised cells including ciliated epithelial cells in the oviduct. Light and electron microscopes. How to prepare a microscope slide including why we stain the sample. How to use a light microscope. What a healthy diet contains. Why we digest food. Our stomachs contain hydrochloric acid and bacteria to help us digest food. Digestive enzymes. Substrates and products of digestion. Lock and key mechanism for enzymes. Factors affecting enzymes. Denaturation of enzymes. Concentration gradients for diffusion. Oxygen and glucose diffuse into cells for respiration. Active transport in the roots of plants. Osmosis. Why experiments are repeated.	The arrangement, movement and relative energy of particles in each state of matter. Interconversions between states of matter. How particle arrangement changes during interconversions. Heating and cooling curves for pure substances and mixtures. Hazard symbols and safety precautions to minimise risk. Chromatography. Why we draw the start line in pencil in chromatography. Mobile and stationary phase. Pure substances and mixtures on a chromatogram. Simple distillation is used to separate a mixture of two substances with very different boiling points. The purpose of the condenser and thermometer in simple distillation. Fractional distillation. How we can test to see if water is pure. Potable water, waste water and ground water. Steps to produce potable water from waste, ground or sea water.	Units and conversions. Vector and scalar quantities. Estimate typical speeds from given values e.g. walking, running, trains or cyclists. Steepness of a line on a distance time graph shows the objects speed. Acceleration due to gravity = $10m/s^2$. Velocity-time graphs. Size and direction of arrows describes a force. Newton's first, second and third laws. Resultant forces. How mass and force applied affect the acceleration of an object. Gravitational field strength on earth. Typical human reaction time. Stopping distance, thinking distance and breaking distance. Factors that affect thinking distance or breaking distance including speed of the vehicle. Crashing involves large forces. Safety features on cars.
Procedural knowledge	Convert between SI units from pm, nm, µm, mm, m focusing on µm to mm. Carry out measurements. Make conversions to the appropriate unit. Use a microscope to focus and change the	Drawing particle diagrams. Predict the state of matter of a substance when given the melting and boiling point. Interpret heating and cooling curves. Devise a plan to investigate if a substance is pure or a mixture. Calculate Rf value. Identify pure	Categorise quantities into scalar or vector. Calculate average speed, distance or time when given two quantities. Calculate speed with conversions. Record results. Calculate a mean. Evaluate suitability of equipment. Determine the time taken to travel a given

	magnification. Estimate the size of cells from a field of view. Draw images from microscope images labelling the sub-cellular structures. Calculate image size, actual size or magnification. Calculate total magnification of a microscope. Calculate rate of reaction for enzymes. Describe the trend in the data. Identify on a graph when the enzyme is at its optimal and when it is denatured. Follow a method to investigate the effect of pH/temperature on amylase activity. Use iodine to test for starch. Identify independent, dependent and control variables. Record data in a table. Devise a method. Calculate a mean. Calculate a percentage change.	substances and mixtures on a chromatogram. List steps of a method in the correct order. Name the equipment used for chromatography. Identify variables. Write a conclusion from a chromatogram. Suggest improvements to a chromatography experiment. Identifying where evaporating and condensing takes place in distillation. Label the equipment diagram for distillation. Interpret data to suggest appropriate methods to separate substances in mixture.	distance, distance travelled in a certain time and average speed by calculating the gradient on a distance-time graph. Calculate change in speed and acceleration with conversions. Identify and remove anomalous results from a set of data. Draw arrows to represent forces. Calculate resultant force vertically and horizontally. Calculate force, mass or acceleration when given two quantities and the rearranged equation. Investigate acceleration using a ramp and light gates. Measure mass using a balance and force using a Newton meter. Calculate weight, mass or gravitational field strength when given two quantities and the rearranged equation. Calculations to an appropriate number of significant figures or standard form. Measure reaction time using the ruler drop.
Outcomes/Assessment	Key piece and summative assessment.	Key piece and summative assessment.	Key piece and summative assessment.
Prior knowledge	Y7- Sub-cellular structures found in plant, animals and bacteria. Ciliated epithelial cells. Labelling parts of a light microscope. Preparing a microscope slide. Function of the parts of a microscope. Using a microscope to view cells and drawing an observation. Healthy human diet. Digestive enzymes. Diffusion in the digestive system. Diffusion of oxygen and glucose.	Y7 – Classifying materials as solids, liquids and gases. Particle model. Properties of solids, liquids and gases. Changes of state. Boiling and evaporating. Drawing particle diagrams. Pure substances and mixtures. Soluble and insoluble substances. Solutes, solvents and solutions. Temperature can affect how much solute will dissolve in a solvent. The purpose of filtration, evaporation, distillation and chromatography. Drawing and labelling	Y7 – Force measured in Newton's with a Newton meter. Weight, friction, air resistance, thrust, magnetism, reaction force. Contact and non-contact forces. Balanced and unbalanced forces. Force arrows. Gravity. Springs and extension. Resistive forces oppose motion. How to find and calculate speed. Interpreting distance time graphs.

	Osmosis is the movement of water into/out of cells. Y8 – Sperm and egg as specialist cells for reproduction. Function of mitochondria and chloroplasts. Y7 and Y8 – SI units. Converting from kJ to J. Y9 – Converting from g to kg, km to m, cm to m and minutes to seconds.	the equipment for filtration and evaporation. Safety precautions. Using a thermometer. The boiling point of water. Dangers of not having safe drinking water. Carrying out filtration, evaporation, chromatography. Identifying pure substances and mixtures in chromatography. Hazards and safety precautions. Y9 – filtration and crystallisation application of knowledge.	Y9 – Calculating weight on different planets. Conversions between g to kg, cm to m, hours to seconds. Rounding to decimal places. Trends in data. Standard form. How to determine speed. Limitations of using a stop watch. Improving reliability. Errors and improvements in an investigation. Analysing distance-time graphs. Plotting graphs. Calculating speed with conversions and from a distance time graph. How to measure and calculate acceleration. Light gates for measuring speed.
Future learning	KS4 - Cell division by mitosis, stem cells, cell differentiation. Cancer. Specialised cells in plants. Blood cells. Ciliated epithelial cells in the lungs to protect against pathogens. The production of gametes in meiosis, gametes are haploid cells.	KS4 - Compounds as solids liquids and gases at given temperature. Conductivity of compounds in different states. Rates of Reaction and Energy Changes. Activation energy. How energy of particles change during a reaction. Particle Model in physics. Using separation techniques to produce pure dry samples of salts. Fractional distillation to separate fractions in crude oil.	KS4 – Forces and their effects. Force fields. Forces happen between two interacting objects. Reducing the effect of friction. Magnetism and the motor effect. Elastic and inelastic distortion. Investigating the effect of force on extension of a spring.
Why is this being studied?	National curriculum. Building on and applying knowledge learned earlier in KS3.	National curriculum. Building on and applying knowledge learned earlier in KS3.	National curriculum. Building on and applying knowledge learned earlier in KS3.

Summer overview

Year 9	Summer 1 and 2	Summer 1 and 2	Summer 1 and 2
Topic name	Biology - Cardiovascular system	Chemistry - Atomic structure and the periodic table.	Physics - Energy
Declarative knowledge	The structure and function of the cardiovascular system. Levels of organisation in a human cardiovascular system. The function and adaptations of arteries, veins and capillaries. Oxygen and glucose diffuse from the blood into cells. The structure and function of the blood. The role of blood for respiration including red blood cells and plasma. Oxygenated and deoxygenated blood. The function of coronary arteries. Heart muscle cells have many mitochondria. Parts of the respiratory system and how are lungs are adapted for gas exchange. Breathing and heart rate increase during exercise. How ventilation occurs in the lungs.	How the model of the atom has changed over time. The structure of an atom. The mass and charge of protons, neutrons and electrons. Why atoms are overall neutral. Electronic configuration. Isotopes. How elements are arranged in the periodic table including group number, period number and chemical properties. Mass number and atomic number. The size of an atom and the nucleus of an atom. Ions. The arrangement of Mendeleev's periodic table. Diatomic elements. The formula of simple compounds and molecules including, H_2O, CO_2, O_2, Cl_2, H_2, CH_4, NH_3. Reactants and products in word equations. The law of conservation of mass. State symbols. Relative formula mass. Empirical formula and molecular formula.	Units for energy, mass, speed, gravity and height. The law of conservation of energy. Name energy stores and transfers. Every time energy is transferred, some is wasted and transferred to the thermal store of the surroundings. Friction causes heating. Lubrication reduces friction. The equation to calculate efficiency, kinetic energy and gravitational potential energy. Kinetic energy depends on mass and speed. Conduction, convection and radiation. Insulators have low thermal conductivity. Thickness of a material affects the rate of transfer. Reducing unwanted energy transfers in the home. Renewable and non-renewable energy resources including advantages and disadvantages.
Procedural knowledge	Labelling a diagram of heart, cardiovascular system and respiratory system.	Label an atom of hydrogen and helium to show the position of protons, neutrons and electrons. Calculate the number of protons, neutrons and electrons in an atom of any given element or isotope. Draw and write the electronic configuration for the first 20 elements. Identify the symbol of a given element.	Complete Sankey diagrams. Identify useful wasted and total energy supplied from a Sankey diagram. Calculate efficiency using data from diagrams and word problems. Calculate kinetic energy, mass or speed from word problems when given the equation and the rearranged equation. Convert between units. Round to an appropriate number of

		Identify the elements in a simple compound. Calculate the number of atoms in a given formula. Identify reactants and products in a word equation. Write word equations. Identify the appropriate state symbol for a substance from a particle diagram and balanced chemical equation. Balance chemical equations when given the chemical formulae. Calculate percentage by mass of elements in compounds. Calculate the relative formula mass for compounds. Deduce empirical formula of compounds. Deduce molecular formula from its relative formula mass and empirical formula. Calculate empirical formula of a compound from the masses or percentage of the elements in that compound.	decimal places or significant figures. Calculate GPE, mass, gravitational field strength or change in height from word problems when given three quantities and the suitably rearranged equation. Devise a method to measure variables to calculate change in GPE. Calculate GPE, mass, gravitational field strength or change in height from word problems when given three quantities and the suitably rearranged equation. Evaluate and chose the most appropriate energy resource in a scenario. Describe trends in the use of energy resources from graphs.
Outcomes/Assessment	Key piece and summative test	Key piece and summative test	Key piece and summative test
Prior knowledge	KS2 - Main parts of the circulatory system, including the function of the heart, blood vessels and blood. Y7 - The heart is a muscular organ. The heart is essential for life as it pumps blood (carrying oxygen and glucose) to our organs. Heart rate increases as intensity of exercise increases. The hierarchical organisation of multicellular organisms from cells to tissues to	Y7 - Everything is made up of atoms. Structure of an atom. Arrangement of the periodic table. Calculating protons, neutrons and electrons. Y8 - Mendeleev's periodic table. Write word equations. Recall chemical formulae.	KS2 - Idea of food and fuel for energy. Y7 - Food as an energy store. Joule is the unit of energy. Energy cannot be created or destroyed. Energy is stored in different ways. Energy is transferred between stores. When energy is transferred some is wasted. Insulation reduces energy transfers. Renewable and Non – renewable energy resources Y8 - Endothermic and exothermic reactions. Energy transfer between chemical and

	organs to systems to organisms. Digested food molecules diffuse into our blood stream from our intestines. Y8 - All cells in living organisms respire. Respiration releases energy from glucose for processes essential for life. Aerobic respiration happens in the mitochondria. Contraction and relaxation of muscles. The skeleton makes blood cells. Y9 - Comparing aerobic and anaerobic respiration in cells.		thermal stores. Ways energy is transferred. Simple diagrams including Sankey. Introduction of efficiency. Energy transfer by electricity. Energy transferred by waves
Future learning	KS4 - Risk factors, causes and treatments for cardiovascular disease. Detailed heart structure, including names of the 4 chambers. Describing the flow of blood through the heart including the major blood vessels that transport blood into and out of the heart. Cardiac output = stroke volume x heart rate. Explain how this changes with exercise intensity and fitness level. How blood flow to the heart, muscles and other organs changes during exercise. Our blood plasma transports hormones from endocrine glands to target organs.	KS4 – Electrons are involved with chemical reactions. Trends of group 1, group 7 and group 0. Maximum and minimum mass calculations. Moles calculations. Calculate protons, neutrons and electrons for ions. Write symbol equations. Use knowledge of ions to write formula for ionic compounds.	KS4 – Waves transfer energy and information. The electromagnetic spectrum. Electricity. Specific heat capacity. Specific latent heat. Using a Joulemeter.

Why is this being studied?	National curriculum. Building on KS2 and KS3 knowledge of the circulatory system to ensure students have a secure understanding of this before studying later topics such as cardiovascular disease, flow of oxygenated and deoxygenated blood through the heart and why	National curriculum. Building on and applying knowledge learned earlier in KS3. Atoms make up everything and the periodic table is a list of all known elements on Earth. Calculations involving masses are key in chemistry. Word and symbol equations can be used to represent reactions.	National curriculum. Building on and applying knowledge learned earlier in KS3.

KS4 Science curriculum

Year 10 autumn overview

Year 10	Autumn 1	Autumn 1	Autumn 1
Topic name	**Biology – Cells and control**	**Chemistry – Groups in the periodic table**	**Physics – Conservation of energy**
Declarative Knowledge	Stem cells including the differences between adult and embryonic stem cells. Cell division for growth and repair. Cell differentiation. Benefits and risks of using stem cells to treat disease. Meristems in plants. The differences between growth in plants and animals. The stages of mitosis. The characteristics of the cells produced by mitosis. Cancer as uncontrolled cell division. Percentile charts including when a doctor would be concerned about a child's growth. Nervous system. Structure and function of sensory, relay and motor neurones. The process that happens at a synapse. The function of the myelin sheath on neurones. The structure and function of the reflex arc.	Group 1 elements have 1 electron in the outer shell. Physical properties of group 1 metals. The reaction of group 1 (alkali) metals with oxygen, halides and water. How to test reactivity and the order or reactivity in the group. Safety precautions. Halogens are diatomic. The physical properties of the halogens including patterns. The reaction of halogens with metals. The trend in reactivity of the halogens. Test for chlorine gas. Displacement reactions. Properties and uses of noble gases.	The law of conservation of energy. Energy stores and transfers. When energy is transferred some is wasted and transferred to the thermal store of the surroundings. Sankey diagrams. Efficiency. Kinetic energy depends on mass and speed. The units for energy, mass, speed, gravity and height. Equipment to measure mass and height. How to reduce unwanted energy transfers by lubrication. Heating as an energy transfer. Conduction, convection and radiation. Insulators have low thermal conductivity. Thickness of a material affects the rate of transfer, How to reduce unwanted energy transfers in the home. Renewable and non-renewable energy resources including the advantages and disadvantages.

Procedural knowledge	Calculating percentage growth. Identify stages of mitosis from images of mitosis happening in cells. Interpret percentile charts. Identify a sensory and a motor neurone from an image. Label diagrams of sensory, relay and motor neurones.	Predict the missing value when given data on physical properties. Write observations when group 1 metals react with water. Write word equations and balance symbol equations for group 1 metals reacting with water and group 7 halogens reacting with metals and hydrogen.	Calculate efficiency using data from diagrams, when given the equation and/or word problems including converting units. Calculate KE, mass or speed from word problems when given two quantities and the rearranged equation. Calculate GPE, mass, gravitational field strength or change in height from word problems when given three quantities and the rearranged equation. Convert between units. Round to an appropriate number of d.p. or s.f. Devise a method to measure variables needed to calculate change in GPE. Evaluate the most appropriate energy resource. Describe trends in the use of energy resources from graphs.
Assessment/Outcomes	Small test – key piece assessment	Small test – key piece assessment	Small test – key piece assessment
Prior knowledge	All living things are made of cells. Specialised cells and their adaptations including sperm, egg and ciliated epithelial cells. Stem cells divide. Functions of sub-cellular structures in plant and animal cells. Factors affecting growth in plants. Photosynthesis makes glucose for the plant. Humans grow through cell division by mitosis. Data analysis from graphs. Lifestyle factors that can increase the risk of cancer.	Acid and Alkalis. Indicators change colour in an acidic substance. Displacement reactions. Gas tests. Hazard symbols. Electronic configuration. Writing word equations. The periodic table.	Idea of food and fuel for energy. Food as an energy store. Joule is the unit of energy. Energy cannot be created or destroyed. Energy is stored in different ways. Energy is transferred between stores. When energy is transferred some is wasted. Insulation reduces energy transfers. Renewable and Non – renewable energy resources. Energy transfer between chemical and thermal stores. Describing energy transfers. Ways energy is transferred. Simple diagrams including Sankey. Efficiency. Energy transfer by electricity. Light. Energy transferred by waves

Future learning	Specialised cells in plants. Meiosis. Role and adaptation of guard cells in the opening and closing of stomata. Photosynthesis is needed for plants to grow. Plants are an essential part of the carbon cycle. Aerobic and anaerobic respiration in humans.	Displacement reactions in metals. Redox reactions. Identifying gas produced in reactions/electrolysis. Ionic, covalent and metallic bonding. Ionic and half equations.	Waves and the electromagnetic spectrum. Work done and power. Electricity. Particle model, specific latent heat and specific heat capacity.
Why is this being studied?	GCSE Edexcel specification	GCSE Edexcel specification	GCSE Edexcel specification

Year 10 Autumn overview

Year 10	**Autumn 2**	**Autumn 2**	**Autumn 2**
Topic name	**Biology – Genetics**	**Chemistry – Fuels**	**Physics – Waves and the electromagnetic spectrum**
Declarative Knowledge	Haploid and diploid cells. Gametes. The role of meiosis in the body. The characteristics of the cells produced by meiosis. Comparisons between mitosis and meiosis. Structure of DNA including the complimentary	Hydrocarbons. Crude oil. Crude oil is a finite resource. Petrol, diesel and kerosene are obtained from crude oil. Methane is obtained from natural gas. Homologous series. Fractional distillation of crude oil. The fractions of	Waves transfer energy and information but not matter. Examples of waves transferring energy. Longitudinal and transverse waves. Frequency, wavelength and amplitude

	bases and weak hydrogen bonds between the bases. Nucleotide. Extracting DNA from fruit including why each step is carried out. Chromosomes, alleles and genes. Dominant and recessive alleles. Genotype and phenotype. Homozygous recessive, homozygous dominant and heterozygous genotypes. Gametes. Zygotes. The role of alleles in inheritance. DNA mutations can change phenotype or have no effect. Genetic and environmental variation. Continuous and discontinuous variation. Normal distribution. Genome. Human genome project including the advantages and disadvantages.	crude oil, trends in their properties and their uses. Complete and incomplete combustion. Carbon dioxide and water vapour as greenhouse gases. Carbon monoxide is a toxic gas. How acid rain is produced and the effects on the environment. The pH of acid raid. The dangers of oxides of nitrogen from fuel being burned in engines. Cracking of hydrocarbons. How the early Earth's atmosphere formed. Composition of the Earth's early atmosphere and the atmosphere today. How oceans formed and how this decreased the levels of carbon dioxide. How plants changed the composition of the atmosphere. Test for oxygen and carbon dioxide. Greenhouse gases and the greenhouse effect. Human activities that generate greenhouse gases and contribute to global warming. Climate change.	including units. Equipment to measure distance, wavelength, time and frequency. How to determine wave speed on water. Why it is difficult to take measurements to determine wave speed and suggested improvements to the method. How to determine the frequency. How to determine wave speed in a solid. How to determine the speed of sound in air including suggested improvements to a method. What happens when a wave hits a boundary. Transparent objects transmit light. Light travels in straight lines. Refraction. How to measure the angle of refraction. The changes in direction of light when moving into a different medium. Electromagnetic spectrum in order of wavelength and frequency. Visible light. EM waves are transverse and travel at 300, 000, 000 m/s in a vacuum. Uses and dangers of EM waves.
Procedural knowledge	Extracting DNA from fruit. Devising a method. Control variables. Draw punnett squares for inheritance of gender using X and Y. Draw punnett squares for heterozygous and homozygous crosses. Calculate probability of inheriting characteristics. Interpret pedigree analysis charts and genetic diagrams. Calculate probability of characteristics from pedigree charts. Construct a tally chart with frequency.	Write the word equation for complete and incomplete combustion. Balance symbol equations. Deduce the formula of a cracked hydrocarbon.	Identify frequency, wavelength and amplitude from wave diagrams. Calculate speed, distance or time when given two quantities and the rearranged equation. Calculate speed, frequency or wavelength when given two quantities and the rearranged equation. Draw and label the normal line on a diagram and the path of a light ray as it passes through a glass block. Identify angle of incidence and

			angle of refraction. Write simple conclusions from data.
Assessment/Outcomes	Big test – summative assessment.	Big test – summative assessment.	
Prior knowledge	Sperm and egg are gametes. Cell division by mitosis. Characteristics of cells produced by mitosis. DNA is located in the nucleus. Story of how the DNA structure was discovered and the role of women in its discovery. DNA is a double helix structure. Extracting DNA from strawberries with focus on writing method. Simple model of genes, chromosomes and DNA. Cause and types of variation including genetic and environmental. Histograms and bar charts. DNA is contained in genes and chromosomes. Mutations can occur in DNA. Genetic conditions result from mutations in DNA. Parents can be carriers of genetic conditions and may only find this out when they have children.	Combustion. Complete combustion general word equation. Hydrogen as an alternative fuel source. Writing word and symbol equations. Hydrogen and Carbon are elements in the periodic table. Fractional Distillation. The abundance of gases in the Earth's early atmosphere and the atmosphere today. Renewable and non-renewable resources. Red blood cells carry oxygen.	All waves transfer energy. Sound waves. Sound needs particles to travel. The denser the substance faster the wave travels. Frequency, wavelength, amplitude. Direction of vibrations determines type of wave. Longitudinal and transverse waves. Speed of sound and how it can be measured. Limitations of using a stopwatch to measure fast things over short distances. How to improve reliability. Identify errors and suggest improvements in an experiment. Draw and label ray diagrams to represent the behaviour of light. Reflection, transmission, absorption. Opaque and transparent. Light is a transverse wave. Colours are light waves of different frequency and colour. White light is a combination of different wavelengths. Prisms use refraction to separate white light into the visible spectrum.

Future learning	Function of the menstrual cycle in humans and role of hormones Infertility treatments, including IVF and clomifene therapy. Genetic engineering. There is one universal genetic code. You can take a gene from a human, put it into a bacterium and the bacterium will make the human protein. The inheritance of advantageous characteristics due to natural selection and selective breeding. The role of variation in natural selection and evolution of a species, including the evolution of antibiotic resistant bacteria. The role of variation in selective breeding to produce organisms with desired characteristics.	Carbon cycle (biology). Covalent bonding.	Radioactivity. Ionising radiation. Electrons and energy levels. Photosynthesis.
Why is this being studied?	GCSE Edexcel specification	GCSE Edexcel specification	GCSE Edexcel specification

Year 10 spring overview

Year 10	**Spring 1**	**Spring 1**	**Spring 1**
Topic name	**Biology – Natural selection and genetic modification**	**Chemistry – Rates of reaction and energy changes**	**Physics – Radioactivity**
Declarative Knowledge	The stages of natural selection including antibiotic resistance in bacteria. Evidence for human evolution including changes in skeletal structure and stone tools. How to date fossils and stone tools. Classification using the 5 kingdoms	Factors that affect the rate of a reaction. Collision theory. How temperature, concentration and pressure affect the rate of reactions in terms of collisions. Equipment and method needed to investigate how changing surface area of marble chips	Radioactive substances. Sources of background radiation. Unit for radiation. Methods for measuring and detecting radiation. Structure of the atom including mass and charge of protons, neutrons and electrons. Isotopes. Behaviour of

	and 3 domains. How the 3 domain system was developed using genetic analysis. Genetically modified organisms. Benefits and risks of genetic engineering. Stages of selective breeding. Benefits and risks of selective breeding. **Stages of genetic engineering including the use of restriction enzymes, ligase, complimentary sticky ends to produce recombinant DNA.**	affects rate of reaction with acid, how temperature affects the rate of reaction between sodium thiosulfate reacting with hydrochloric acid and how concentration of acid affects the rate of reaction between sodium thiosulfate reacting with hydrochloric acid. A gas syringe to measure the volume of gas produced in an investigation. Catalysts. Activation energy. Enzymes are biological catalysts. Exothermic and endothermic reactions including bond energy.	isotopes with unstable nuclei. Size of atoms. Plum pudding and Rutherford's model of the atom. Rutherford's gold foil experiment and results. Electron shells. Dangers and safety precautions of ionising radiation. Difference between contamination and irradiation. Half-life. Alpha, beta and gamma including the nature, mass and charge. How the structure of the nucleus changes when it emits and alpha particle. How the structure of the nucleus changes when it emits beta particles. Changes to the nucleus after gamma emission. Penetration of alpha, beta and gamma and how to measure this. Ionisation of alpha, beta and gamma. Why being contaminated with alpha is more dangerous than being irradiated by alpha. The effect of radiation on atoms. Ionising radiation. The effect of EM radiation on electrons.
Procedural knowledge	Apply the stages of natural selection to new scenarios. Compare and contrast genetic engineering and selective breeding. Interpret time lines. Extract information from graphs.	Calculate the rate of a reaction. List the steps of a method in the correct order. Control variables for an investigation. What we are measuring and changing in an investigation. Write a conclusion from data. Interpret data from graphs. Determine whether a reaction is exothermic or endothermic from temperature change. Draw reaction profiles for endothermic and exothermic reactions and label with the reactants, products and activation energy. **Calculate the energy change**	Determine half-life from a graph. Calculate activity and mass from half-life. Identify control variables in an investigation. Write chemical symbols to show the nucleus before and after given decays and element produced by a given decay. Draw and label the structure of the atom.

		for a given reaction when given the energy of bonds.	
Assessment/Outcomes	Big test – summative assessment.	Big test – summative assessment.	
Prior knowledge	Genetic and environmental variation. The stages of natural selection. Story of Charles Darwin. DNA is inherited from parents. Alleles are inherited from our parents. Variation coming from mutations and sexual reproduction Bacteria are unicellular organisms. Some bacteria are pathogens that cause disease. Antibiotics only kill bacteria. Extinction and gene banks. Living things have changed over time and that fossils provide evidence for this. Fossils are found in the Earth's crust – the lower down the fossil, the older the fossil is. How fossils are formed. Classifying plants and animals based on specific characteristics. Classification keys to group, identify and name living. Structure of DNA. Genes and chromosomes. Plasmid DNA in bacteria. Plants photosynthesise to produce food and oxygen. Factors affecting growth in plants. Insulin controls blood glucose levels.	Use of a measuring cylinder for volume, stop clock for measuring time, thermometer to measure temperature, balance to measure mass. Water bath to control temperature. Calculating temperature change. Investigating the rate of enzyme reactions. Calculating rate of reaction using 1/time. Energy can't be created or destroyed, only transferred. The particle model. Chemical reactions are a rearrangement of atoms to make something new. A reaction is exothermic if the temperature of the reaction increases. A reaction is endothermic if the temperature of the reaction decreases.	Atoms are made up of 3 subatomic particles, protons, neutrons and electrons and contains a nucleus in the middle. Calculating protons, neutrons and electrons. Atoms are neutral. Ions are charged atoms. Size of atoms. History of the atom. Isotopes. Mass number and atomic number. Ionising radiation. Gamma rays (EM spectrum).

Future learning	Blood glucose regulation by insulin. GM bacteria used to produce human insulin in type 1 diabetics. Non-indigenous organisms outcompeting indigenous organisms when introduced to an ecosystem.	Chemical changes. Bonding.	Application of knowledge.
Why is this being studied?	GCSE Edexcel specification	GCSE Edexcel specification	GCSE Edexcel specification

Year 10 spring overview

Year 10	**Spring 2**	**Spring 2**	**Spring 2**
Topic name	**Biology – Health, disease and the development of medicine**	**Chemistry – Bonding**	**Physics – Forces and energy**
Declarative Knowledge	WHO definition of health. Pathogens. Communicable and non-communicable diseases. Susceptibility. The pathogen that causes cholera, tuberculosis, chalara ash dieback, malaria, HIV and chlamydia. How these diseases spread, how to prevent the spread and treatments. Physical and chemical barriers that protect the body from pathogens. The immune response including - antigens, B-lymphocytes, antibodies and memory lymphocytes. The body's response to a vaccination. Antibiotics kill bacteria and not viruses. Stages of pre-clinical and clinical trials when developing medicines. Blind and double blind trials involving placebos. Risk factors and causes of liver and	Ions, cations and anions. Ionic bonding. Structure of ionic compounds. What elements are in compounds that end in –ide and –ate Polyatomic ions. Covalent bonding. Simple covalent compounds. The structure and properties of covalent compounds. Polymers. Structure and uses of diamond, graphite and fullerene. Metallic bonding. Properties of metals and non-metals. Different bonding models and their limitations. How substances can be classified based on melting and boiling points, solubility and conductivity.	Conservation of energy. Energy transfers between stores from a diagram. Doing work. Work done = energy transferred. Maximum GPE and maximum KE. Energy transfer between GPE and KE. Why the maximum energy stored in an object will decrease. How to reduce unwanted energy transfers. Power including units. Equipment to measure mass, height and time. Vector and scalar quantities. Force is a vector. Examples of contact and non-contact forces. Force fields. Magnetic, electrostatic and gravitational in terms of attraction and repulsion and the cause of the force. **When the resultant force is zero there are still forces acting on the object and these forces are balanced.**

	cardiovascular disease. Treatments for cardiovascular disease.		
Procedural knowledge	Describe and explain trends in data for diseases. Calculate a percentage of a quantity from disease data. Calculate the number of people in a population with a disease when given the sample of data. Calculate BMI and waist-to-hip ratio.	Draw dot and cross diagrams for ionic compounds. Determine whether a particle is an ion or an atom when given the number of protons, neutrons and electrons. Calculate protons, neutrons and electrons of ions from mass and atomic number. Determine the name of ionic compounds from the elements that make them. Write simple formulae for ionic compounds. Draw dot and cross diagrams for covalent molecules. Write chemical fomula for covalent compounds from molecular diagrams. Name a polymer from the monomer it's made up of. Identify metals and non-metals from their properties.	Calculate Work done, force applied or distance moved from word problems when given two quantities and the suitably rearranged equation. convert between units and round to an appropriate number of d.p. or s.f. Follow a method to investigate work done and power. Identify variables in an investigation. Calculate weight, work done and power. Write a method. **Draw free body diagrams. Calculate resultant force vertically and or horizontally from free body diagrams. Calculate from a scale vector diagram resultant force when the forces acting, are not in the same plane (vertical or horizontal). Resolve force vectors into vertical and horizontal components using scale vector diagrams.**
Assessment/Outcomes	Big test – summative assessment.	Big test – summative assessment.	Big test – summative assessment.

Prior knowledge	WHO definition of health. What a pathogen is and the 4 types of pathogen. Common diseases in the local community and how to prevent their transmission. Importance of vaccines. Heart as a muscular organ that pumps blood around the body. Heart dissection. Function of the heart for respiration. Blood vessels - veins, arteries and capillaries.	Particles in solid, liquids and gases have a force of attraction holding them together. Atomic Structure and the Periodic Table. Calculating the number of protons, neutrons and electrons in an atom of an element. Group 1 elements lose an electron when they reacts and group 7 elements gain an electron when they react. Bond energy changes in exothermic and endo thermic reactions. Hydrocarbons and cracking.	Units for energy. Conservation of energy. Energy stores and transfers. Energy is wasted during transfers. Resistive forces oppose motion. Sankey diagrams. Calculating efficiency. Energy diagrams to describe changes in the way energy is stored. How to reduce unwanted energy transfers. Calculate change in KE and GPE stores. Converting to standard units. Rounding to decimal places and significant figures. Use standard form. Units for force. Contact and non-contact forces. Calculating weight. Newton's laws. Driving/resistive forces. Force arrows. Calculating resultant force. Attraction and repulsion between magnetic poles. Electric fields. Vector and scalar quantities.
Future learning	Blood glucose regulation by insulin and glucagon. Type 1 and 2 diabetes cause, risk factors and treatments. Obesity as a risk factor for diabetes, cardiovascular disease and cancer. Flow of blood through the heart. Adaptations in the cardiovascular system and respiratory system for increased rate of respiration.	Electrolysis. Extracting metals from ores. Ions in acids and alkalis. When hydrogen and chlorine react, they produce hydrogen chloride, when dissolved in water it produces hydrochloric acid. During reactions with acids, bonds must be broken in the reactants and made in the products. Haber process.	Electrons doing work (electricity). Gas pressure. Doing work on springs.
Why is this being studied?	GCSE Edexcel specification	GCSE Edexcel specification	GCSE Edexcel specification

Year 10 summer overview

Year 10	Summer 1	Summer 1	Summer 1

Topic name	Biology – Plant structures and functions	Chemistry – Bonding continued	Physics – Particle model
Declarative Knowledge	Plants and algae are producers. Word equation for photosynthesis. Light, temperature and carbon dioxide as limiting factors for photosynthesis. Photosynthesis is an endothermic reaction. Explain the role of hydrogen carbonate indicator when investigating photosynthesis. Osmosis and active transport. How root hair cells are adapted to increase the rate of absorption. Structure and function of the xylem and phloem. Describe how water and sucrose move through a plant by transpiration and translocation. Glucose is made in the leaves and converted to sucrose to be transported around the plant. Explain how and why stomata open and close. How a potometer is used to investigate transpiration. Light intensity, air movement and temperature increase the rate of transpiration and therefore increase the volume of water taken in by a plant. **Rate of photosynthesis is directly proportional to light intensity and inversely proportional to distance from light source.**		Particle arrangements for solids, liquids and gases including energy and movement. Equation for calculating density. Why density changes as state changes in terms of mass and number of particles in a certain volume. Units and equipment for mass and volume. How we can use a measuring cylinder to find the volume of water displaced by an object. How to determine the density of an irregular object or liquid. Heating a substance transfers energy. Why there is no increase in temperature as a substance changes shape. Specific latent heat. Changing state requires energy transfer. The meaning of temperature. Specific heat capacity. How to determine a change in temperature. Joulemeter to measure energy transferred. Gas pressure. The effect of temperature on pressure. Absolute zero.

Procedural knowledge	Carry out a method to investigate the effect of light intensity on the rate of photosynthesis in algal balls using hydrogen carbonate indicator and pond weed using sodium hydrogen carbonate solution as the source of carbon dioxide. Identify control variables for an investigation. Describe a suitable control investigation. Write a conclusion. Describe and explain the trend in results. Suggest how to improve the investigation e.g. use a heat filter to control temperature. Prepare a microscope slide of a stomata peel. Calculate IAM. Draw and label stomata including guard cells from a micrograph image. Calculate the rate of photosynthesis and transpiration. **Calculate light intensity using the inverse square law.**		Calculate density, mass or volume by identifying quantities from word problems. Calculate to the correct number of d.p. or sig.fig Interpret a temperature-time graph for a substance. Calculate specific latent heat when given the equation. Calculate specific heat capacity when given the equation. Convert between units. Identify variables in an investigation. Write simple conclusions. Convert between Celsius and Kelvin.
Assessment/Outcomes	Big test – summative assessment.	Big test – summative assessment.	Big test – summative assessment.
Prior knowledge	Word equation for photosynthesis. Photosynthesis happens in the chloroplast. Conditions needed for plant growth. Endothermic reactions in chemistry. Pondweed practical to look at the production of oxygen from plants at different temperatures focusing on data collection and describing trends in data. Carbon dioxide is acidic and will change the colour of a pH indicator. Diffusion, osmosis and active transport. Sub-cellular structures and specialised cells including root hair cells in plants. Water moves into roots by osmosis.		Properties of solids, liquids and gases. Changing state. Drawing particle diagrams. Changing energy of the particles, changes the state that the substance is in. Particle arrangement in term of arrangement and movement. Heating and cooling curves. Density. Calculating density. Method to determine density of solids and liquids. Relative densities of solids, liquids and gases. Water as an anomaly for density. Pressure in fluids. Units for energy, mass, volume, density, temperature.

	Preparing microscope slides and use of a microscope. Calculating IAM.		
Future learning	Role of photosynthesis in the carbon cycle. Role of plants in the water cycle. Role of plants in the nitrogen cycle. The use of hydrogen carbonate indicator to investigate respiration. Algae and plants in eutrophication. The role of diffusion and gas exchange in respiration. Application of skill to prepare samples for any type of cells.	Application of knowledge.	Forces and matter.
Why is this being studied?	GCSE Edexcel specification	GCSE Edexcel specification	GCSE Edexcel specification

Year 10 summer overview

Year 10	**Summer 2**	**Summer 2**	**Summer 2**
Topic name	**Biology – Ecosystems**	**Chemistry – Chemical changes**	**Physics – Forces and matter**

Declarative Knowledge	Levels of organisation in an ecosystem. Interdependence. Biodiversity. Biotic and abiotic factors in ecosystems including predation and competition as biotic factors. How a non-indigenous species would affect an ecosystem. The method to estimate population size using random sampling. The method to investigate the distribution of organisms using belt transects. How to set up a pitfall trap to sample invertebrate using bait. Eutrophication stages. The advantages and disadvantages of fish farms including eutrophication. Parasitism and mutualism. Stages of the water cycle. Producing potable water through desalination, distillation and reverse osmosis. Stages of the carbon cycle. Why plants need nitrates. Stages of the nitrogen cycle including the roles of bacteria. Crop rotation.	Hazard symbols and safety precautions. pH of acidic, neutral and alkaline substances including the colour changes seen if universal indicator, litmus, phenolphthalein or methyl orange is added to the substance. Universal indicator used with the pH scale can be used to determine the strength of an acidic or alkaline substance. The ions released when acids or alkalis are dissolved in water. Neutralisation reactions produce salt and water. The salt produced if hydrochloric acid, sulfuric acid or nitric acid reacts with metal. Gas tests for hydrogen and carbon dioxide. An alkali is a soluble base. The purpose of titration and the use of a pipette, burette, white tile and swirling the mixture in the method. Why titration is repeated 3 times. The method used to prepare a pure dry sample of a soluble salt, including why the acid is heated and why we add excess base. Why the end products of preparing a salt are salt and water. The colour and state of sulfuric acid, copper oxide, copper sulfate solution and crystals. Solubility. Precipitation reactions. The purpose of filtration and a desiccator in the investigation. The equation to calculate concentration. **Hydrogen ions can affect pH. Concentrated and dilute mean. Strong and weak acids. Limiting reactant and how to deduce this.**	Distortion. Elastic distortion and every day examples of this. Inelastic distortion and every day examples of this. The effect of two or more forces on an object or just one force. Units for force and extension. How to calculate extension of a spring. Linear and non-linear relationships on a force extension graph.

Procedural knowledge	Interpret food webs including the consequence of removing one species. Carry out random sampling using quadrats. Record results in a table. Calculate a mean. Write a conclusion. Set up a pitfall trap. Complete a tally chart to count the number of organisms in a pitfall trap. Describe trends in data. Draw food chains including mutualistic relationships.	Write the word equations for metals, metal hydroxides, metal oxides and metal carbonates reacting with acid. Balance symbol equations including state symbols. Identify variables in an investigation. Describe trends on a graph. Calculate a mean. Identify hazards in an investigation and suggest safety precautions. List the steps of a method in the correct order. Write the word and symbol equations for precipitation reactions. Write conclusions from results. Calculate concentration. Convert from cm_3 to dm_3. **Rearrange concentration equation to calculate mass or volume. Use Avogadro's constant to calculate number of particles in a substance. Calculate moles using the equation mass/Mr. Balance equations using masses.**	Identify hazards and safety precautions for investigating springs. Follow a method to investigate the effect of force on extension of a spring. Record results in a table. Plot results on a given axis. Compare results for different springs. Interpret force-extension graphs to compare springs. Calculate a gradient on a force-extension graph. Calculate work done extending a spring during linear extension from force-extension graph. Use the relationship F = k × x. Convert between units. Calculate E = 0.5 x k x x2.
Assessment/Outcomes	Big test – summative assessment.	Big test – summative assessment.	Big test – summative assessment.
Prior knowledge	Living and non-living factors in ecosystems. Biodiversity. Importance of maintaining biodiversity. Interdependence. Food webs and food chains. Sampling techniques using quadrats. Photosynthesis.	Neutralisation reaction. pH of acidic, neutral and alkaline substances. pH of chlorine and carbon dioxide gas. Test for chlorine, carbon dioxide and hydrogen. Hazard symbols. Word and symbol equations for chemical reactions. Deducing the charge of an ion to write formulae for compounds. Calculating M_r. Density. Filtration and crystallisation.	Forces measured in Newton's with Newton meter. Calculate weight. Springs and extension. Balanced/unbalanced forces. Force arrows: size and direction. Gravity. Unbalanced forces can change the speed/direction/shape of objects. Weight on other planets. Energy transfers. Elastic store. Forces doing work.

Future learning	Water, carbon and nitrogen cycle. Growth in plants. Natural selection. Photosynthesis as an endothermic reaction. Investigating the effects of light intensity and temperature on the rate of photosynthesis in algae and pond weed.	Investigating photosynthesis using hydrogen carbonate indicator. Titration. Electrolysis. Extracting metals and equilibria.	Application of knowledge.
Why is this being studied?	GCSE Edexcel specification	GCSE Edexcel specification	GCSE Edexcel specification

Year 11 autumn overview

Year 11	Autumn 1	Autumn 1	Autumn 1
Topic name	**Biology – Animal coordination, control and homeostasis**	**Chemistry – Electrolysis**	**Physics – Electricity**
Declarative Knowledge	The hormones produced by the pituitary gland, thyroid gland, pancreas, adrenal glands, ovaries and testes and their target organs. How hormones are transported from endocrine glands to target organs. The four stages of the menstrual	Purpose of electrolysis. Ionic compounds as electrolytes, Cations and anions. Anode and cathode. How ions move in electrolysis. Products produced when molten compounds or ionic compounds are decomposed. Effervescence. Gas	Structure of the atom. Current, charge, potential difference and resistance including units. Why metals are good conductors. Complete circuits. The heating effect including advantages and disadvantages. How switches can be

	cycle, including the role of oestrogen and progesterone. How oestrogen and progesterone in hormonal contraceptives prevent pregnancy. Barrier and hormonal methods of contraception. How blood glucose levels are controlled by insulin. The cause and treatments of type 1 and type 2 diabetes. **The fight or flight response including the effects of adrenalin on the body to increase rate of respiration including the effects of adrenalin on the liver. How metabolic rate is controlled by the TRH - TSH - thyroxine pathway, including negative feedback. The stages of the menstrual cycle including the roles of FSH, oestrogen, LH and progesterone and negative feedback. The use of hormones for infertility treatment including IVF and clomifene therapy. The role of insulin and glucagon in controlling blood glucose levels.**	tests for hydrogen, carbon dioxide, chlorine and oxygen. Reactivity series. More reactive metals form cations. How to determine reactivity.	used to control different parts of the circuit. Series and parallel circuits. How to use a voltmeter and ammeter. Variable resistors. I-V graphs for fixed resistor, filament lamp and diode. Resistance-temperature graphs for thermistors. Resistance-light graphs for LDR's. Power including units. Power consumption of appliances used for heating. P.D. and frequency of UK power supply. Direct current and alternating current. Earth wires, fuses and circuit breakers in ensuring safety.
Procedural knowledge	Read data from a graph. Describe the trend in data on a graph. Evaluate data on the effectiveness of contraceptives. Calculate BMI and waist to hip ratio. Evaluate the correlation between BMI and type 2 diabetes.	Draw the equipment set up for electrolysis. Follow a method to electrolyse copper sulfate. Calculate mass change in the anode and cathode. Describe a trend in data. Write observations of what can be seen happening at the anode and cathode when using inert electrodes.	Calculate using Charge = Current × Time. Calculate using Energy transferred = Charge × p.d. Calculate using energy transferred = current × potential difference × time. Calculate using $V = I \times R$. Convert between units. Substitute into rearranged equations. Draw symbols for cells, batteries, switches, voltmeters, ammeters, resistors, variable resistors, lamps, motors, diodes, thermistors, LDRs and LEDs. Construct circuit diagrams from

			written descriptions including a test circuit. Calculate V, I or R at different places in a circuit using the rules for current and p.d. in series and parallel circuits. Record results in a table. Describe the relationship from results between V, I and R. Compare results for series and parallel circuits. Calculate using R= V/I. Devise a method for an investigation. Calculate power using P=E/t or P=I×V. Calculate using Power = current^2 × resistance.
Assessment/Outcomes	Big test – Summative assessment	Big test – Summative assessment	Big test – Summative assessment
Prior knowledge	Cells and organs. Menstrual cycle starts during puberty. Stages of the menstrual cycle over a month. Males and female reproductive system. Pregnancy. Function of heart and its role in providing oxygen and glucose for respiration. Role of plasma in carrying hormones around the body. Organs and organ systems. Function and adaptation of organs and tissues in the digestive system and respiratory system. Insulin controls blood glucose levels. Effects of poor lifestyle on the development of type 2 diabetes. How type 1 and type 2 diabetes are treated. Genetically modified organisms producing insulin. BMI and waist:hip ratio.	Extraction of metals. Reactivity series. Chemical Reactions. Decomposition. - Formulae, equations, hazards, half equations. Electrons are negatively charged. The properties of ionic compounds, how ions are formed. Graphite is inert and has delocalised electrons to conduct electricity. When a solid melts, the particles are free to move. Electrical current.	Conductors and insulators. How to measure, current and p.d. including units. Resistance calculations. The heating effect. Simple circuit diagrams. Series and parallel circuits. Ammeters and voltmeters. States of matter. Atomic model. Periodic table. Electrons moving in a circuit. Metallic structure. Power. Investigations with simple circuits, increasing the number of bulbs. Investigating the effect of length of wire on resistance in a circuit. Electrical safety.
Future learning	Application of knowledge.	Application of knowledge.	Magnetism and electromagnetism. Electrolysis.
Why is this being studied?	GCSE Edexcel specification	GCSE Edexcel specification	GCSE Edexcel specification

Autumn overview

Year 11	Autumn 2	Autumn 2	Autumn 2
Topic name	**Biology – Exchange and transport in animals**	**Chemistry – Extracting metals**	**Physics – magnetism and electromagnetic induction**
Declarative Knowledge	How the lungs are adapted for gas exchanged. Gas exchange of oxygen and carbon dioxide. The role of the blood for respiration. The structure and function of the blood. How red blood cells are adapted to their function. The structure and function of arteries, veins and capillaries. How each blood vessel is adapted to its function. Cardiac output equation. The journey of blood through the heart. The role of valves in the heart and veins. Why the left ventricle muscle is thicker. Word equations for aerobic and anaerobic respiration. The method to investigate respiration in small organisms using a respirometer. The purpose of soda lime when investigating respiration. Why the dye in the capillary tube	Order metals by reactivity from observations. Identify metals from observations and properties. Write word equations for chemical reactions involving metals. Balance given symbol equation. Metals from ores. Methods to extract metals based on reactivity using carbon or electrolysis. Oxidation and reduction. Corrosion. Burning magnesium in air to produce magnesium oxide. Advantages of recycling metal. Life cycle assessments. Reversible reactions. Haber process. Dynamic equilibria.	Attraction and repulsion. Magnetic materials. The difference between permanent and induced magnets. Shape and direction of a magnetic field around a bar magnet. Evidence that Earth's core is magnetic. Magnetic fields. Current in a wire creates a magnetic field. Strength of the magnetic field depends on current. Shape and strength of a magnetic field by solenoid. National grid. Step up transformers. Transformers to reduce energy losses. **Current carrying wire placed in a magnetic field will experience a force caused by the interaction of two magnetic fields. Fleming's Left Hand Rule.**

	moves when investigating respiration.		
Procedural knowledge	Calculate surface area to volume ratio. Calculate cardiac output, stroke volume or heart rate when given to values. Draw arrows on a diagram of the heart to show flow of blood. Use a table to compare aerobic and anaerobic respiration. Follow a method to investigate the effect of temperature on rate of respiration in meal worms. Control variables for the investigation. A suitable control experiment for the investigation. Calculate rate of respiration.	Deduce which substances have been oxidised and which reduced when given word equation. Carry out a method to burn magnesium in air to form magnesium oxide. Measure the mass accurately using a mass balance. Calculate empirical formula using the masses obtained from a practical. Calculate the formula mass of reactants and products. Calculate minimum/maximum mass. Evaluate life style assessments for different products.	Use plotting compasses to show the shape and direction of a magnetic field. Sketch the shape of a magnetic field around a straight current carrying wire. Determine the direction of the magnetic field when given the direction of current. Calculate using the power equation. **Calculate size of Force, magnetic flux density, current or length of wire, from F =B x I x l.. Electromagnetic induction. Factors that affect the size of an induced p.d. How the speed of movement and direction of movement can affect p.d.**
.Assessment/Outcomes	Big test – summative assessment.	Big test – summative assessment.	Big test – summative assessment.

Prior knowledge	Gases are exchanged in the lungs, parts of the respiratory system, how lungs are adapted for gas exchange. Diffusion definition. Oxygen diffuses from the lungs to the blood. Oxygen and glucose diffuse into cells from the blood. The heart is a muscular organ that pumps blood. Contraction and relaxation of muscles. The skeleton makes blood cells. Red blood cells carry oxygen and white blood cells kill pathogens. Comparing the processes of aerobic and anaerobic respiration. Respiration releases energy. Respiration happens in the mitochondria of cells. Using a respirometer. Basic heart structure, adaptations of blood vessels, role of the blood for respiration, how our heart gets the energy it needs to beat. Muscle cells have lots of mitochondria to release energy for movement. Variables in an investigation and devising a method. Setting up a control experiment. Describing and explaining trends in data.	Metals are found in the Earth's crust. Reactivity Series. Recycling. Displacement reactions. Calculating % by mass. Formulae, Equations and Hazards – writing ionic equations, half equations, word and symbol equations. Structure of metals. Electrolysis. Conservation of mass. Endothermic and exothermic reactions. Catalysts.	Attraction and repulsion between magnetic poles. Magnetic materials. Permanent and induced magnets. Field around a bar magnet. Earth has a magnetic field. Uses of magnets in everyday life. Current causing a magnetic field. Investigating the strength of electromagnetics. Motors. Electricity.
Future learning	The effects of adrenalin on the body to increase the rate of respiration. Hormones transported in the blood plasma from endocrine glands to target organs.	Application of knowledge.	Application of knowledge.
Why is this being studied?	GCSE Edexcel specification	GCSE Edexcel specification	GCSE Edexcel specification