Science – biology

INTENT- KS3

We create a positive and safe learning environment, where students feel confident to explore ideas surrounding science. KS3 is about students finding their feet, learning the foundations and skills that are required by excellent scientists. In year 7 we start learning about cells, atoms and forces, the essential building blocks for building the knowledge in our science curriculum. Science is a hierarchical subject, where success in each of the three specialisms is reliant on mastery of all that sits below. The principal focus of science teaching in KS3 is to develop a deeper understanding of a range of scientific ideas in the subject disciplines of biology, chemistry and physics. Pupils should begin to see the connections between these subject areas and become aware of some of the big ideas underpinning scientific knowledge and understanding.
Our intent is to ensure that students have a developed understanding of the World and Universe they live in, allowing them to be successful in any route they choose; providing opportunity for academic or personal success within the Sciences, or wider career network. We are inclusive with all of our students within the KS3 curriculum, learning essential practical and team work skills encouraging students to develop scientific enquiry skills to explore the world around them.

SKILLS AND KNOWLEDGE

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
7	**Cells and organisation**: Observing, interpreting and recording cell structure; Functions of the cell components; Similarities and differences between plant and animal cells; Role of diffusion in the movement of materials in and between cells; Unicellular organisms; Hierarchical organisation of multicellular organisms **The skeletal and muscular systems**: Structure and functions of the human skeleton; Biomechanics – the interaction between skeleton and muscles; Function of muscles and examples of antagonistic muscles. Nutrition and digestion; Content of a healthy human diet; Calculations of energy requirements in a healthy daily diet; Consequences of imbalances in the diet; Tissues and organs of the human digestive system; Importance of bacteria in the human digestive system; Plants making carbohydrates and gaining mineral nutrients and water **Gas exchange systems**: Structure and functions of the gas exchange system in humans; Mechanism of breathing to move air in and out of the lungs; Explain the movement of gases and measuring lung volume; Impact of exercise, asthma and smoking on the human gas exchange system; Role of leaf stomata in gas exchange in plants. **Reproduction**: Reproduction in humans, structure and function of the male and female reproductive systems, menstrual cycle, gametes, fertilisation, gestation and birth, effect of maternal lifestyle on the foetus through the placenta; Reproduction in plants, flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, quantitative investigation of some dispersal mechanisms.	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical techniques
	Students will develop their KNOWLEDGE of	**Students will develop their SKILLS in**
8	**Health**: Effects of recreational drugs and misuse, on behaviour, health and life processes. **Relationships in an ecosystem**: Interdependence of organisms in an ecosystem, including food webs and insect pollinated crops; Importance of plant reproduction through insect pollination in human food security; How organisms affect, and are affected by, their environment, including the accumulation of toxic materials. **Photosynthesis**: The reactants in, and products of, photosynthesis, and a word summary for photosynthesis; Dependence of almost all life on Earth, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere; Adaptations of leaves for photosynthesis. **Cellular respiration**: Aerobic and anaerobic respiration in living organisms; Word summary for aerobic respiration; Process of anaerobic respiration in humans and micro-organisms, summary for anaerobic respiration; differences between aerobic and anaerobic respiration **Inheritance, chromosomes, DNA and genes**: Heredity as the process by which genetic information is transmitted from one generation to the next; Simple model of chromosomes, genes and DNA in heredity; differences between species; variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation; variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection; changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction; the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical techniques

SKILLS AND KNOWLEDGE

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
9	**Cell biology:** cells as the basic structural unit of all organisms; adaptations of cells related to their functions; the main sub-cellular structures of eukaryotic and prokaryotic cells; stem cells in animals and meristems in plants; enzymes; factors affecting the rate of enzymatic reactions; the importance of cellular respiration; the processes of aerobic and anaerobic respiration; carbohydrates, proteins, nucleic acids and lipids as key biological molecules; need for transport systems in multicellular organisms, including plants; relationship between the structure and functions of the human circulatory system;	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical

INTENT- KS4

Our KS4 curriculum builds on the strong foundations that students have set up themselves in KS3. Teaching the sciences in KS4 continues with the process of building upon and deepening scientific knowledge and the understanding of ideas developed in earlier key stages in the subject disciplines of biology, chemistry and physics. For some students, studying the sciences in key stage 4 provides the platform for more advanced studies, establishing the basis for a wide range of careers. For others, it will be their last formal study of subjects that provide the foundations for understanding the natural world and will enhance their lives in an increasingly technological society.
Science is changing our lives and is vital to the world's future that all students should be taught essential aspects of the knowledge, methods, processes and uses of science. They should be helped to appreciate the achievements of science in showing how science has evolved with time. The sciences taught are linked to different careers in the scientific world. We are inclusive of all students providing triple science for all and differentiating these disciplines to allow all to succeed, this includes the addition of entry level certificate.

SKILLS AND KNOWLEDGE

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
10 & 11	**Health, disease and the development of medicines:** relationship between health and disease; communicable diseases including sexually transmitted infections in humans (including HIV/AIDs); Non-communicable diseases; bacteria, viruses and fungi as pathogens in animals and plants; body defences against pathogens and the role of the immune system against disease; reducing and preventing the spread of infectious diseases in animals and plants; process of discovery and development of new medicines; impact of lifestyle factors on the incidence of non-communicable diseases. **Coordination and control:** principles of nervous coordination and control in humans; relationship between the structure and function of the human nervous system; relationship between structure and function in a reflex arc; principles of hormonal coordination and control in humans; hormones in human reproduction, hormonal and non-hormonal methods of contraception; homeostasis. photosynthesis as the key process for food	**The development of scientific thinking:** ways in which scientific methods and theories develop over time; using a variety of concepts and models to develop scientific explanations and understanding; appreciating the power and limitations of science and considering ethical issues which may arise; explaining everyday and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments; evaluating risks both in practical science and the wider societal context, including perception of risk; recognising the importance of peer review of results and of communication of results to a range of audiences. **Experimental skills and strategies:** using scientific theories and explanations to develop hypotheses; planning experiments to make observations, test hypotheses or explore phenomena; applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments; carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations; recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative; making and recording observations and measurements using a range of apparatus and methods; evaluating methods and suggesting possible improvements and further investigations.

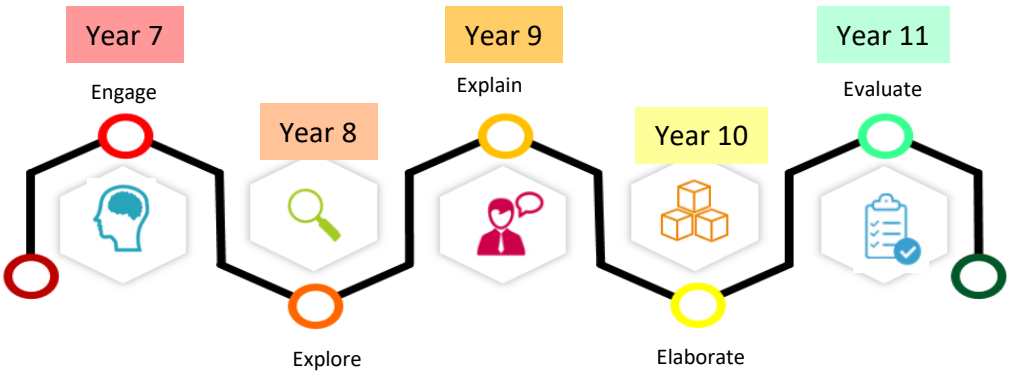
SKILLS AND KNOWLEDGE		
	Students will develop their KNOWLEDGE of	**Students will develop their SKILLS in**
10 & 11	**Ecosystems:** levels of organisation within an ecosystem; some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community; how materials cycle through abiotic and biotic components of ecosystems; role of microorganisms (decomposers) in the cycling of materials through an ecosystem; organisms are interdependent and are adapted to their environment; importance of biodiversity; methods of identifying species and measuring distribution, frequency and abundance of species within a habitat; positive and negative human interactions with ecosystems. **Evolution, inheritance and variation:** genome as the entire genetic material of an organism; How the genome, and its interaction with the environment, influence the development of the phenotype of an organism; potential impact of genomics on medicine; most phenotypic features being the result of multiple, rather than single, genes; single gene inheritance and single gene crosses with dominant and recessive phenotypes; sex determination in humans; genetic variation in populations of a species; process of natural selection leading to evolution; evidence for evolution; developments in biology affecting classification; importance of selective breeding of plants and animals in agriculture; uses of modern biotechnology including gene technology; some of the practical and ethical considerations of modern biotechnology.	**Analysis and evaluation:** applying the cycle of collecting, presenting and analysing data, including; presenting observations and other data using appropriate methods; translating data from one form to another; carrying out and representing mathematical and statistical analysis; representing distributions of results and making estimations of uncertainty; interpreting observations and other data, including identifying patterns and trends; making inferences and drawing conclusions; presenting reasoned explanations, including relating data to hypotheses; being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error; communicating the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations. **Vocabulary, units, symbols and nomenclature:** developing their use of scientific vocabulary and nomenclature; recognising the importance of scientific quantities and understanding how they are determined; using SI units and IUPAC chemical nomenclature unless inappropriate; using prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano); interconverting units; using an appropriate number of significant figures in calculations.

OVERVIEW

Qualification gained by the end of year 11: GCSE in Biology

Whole school vision links developed in this subject	After school destinations linked to this subject	
• Allowing student to be encouraged in their learning by providing a safe learning environment so they can be ambitious and achieve above and beyond • British values through mutual respect • Inclusive for all- same setting but differentiated work. • Supporting local providers	A level biology Academic researcher Medicine Biotechnologist Higher education lecturer Marine biologist Microbiologist Nanotechnologist Nature conservation officer,	Pharmacologist Research scientist Zoologist Ecologist Veterinarian Dentist

Science CURRICULUM THEMES



Cross Curriculum links in Science

- Geography- rock cycle,
- Maths- calculations, graphs
- History- history of periodic table/ atom
- PE- anatomy & lifestyle
- English- literacy
- CA- field science

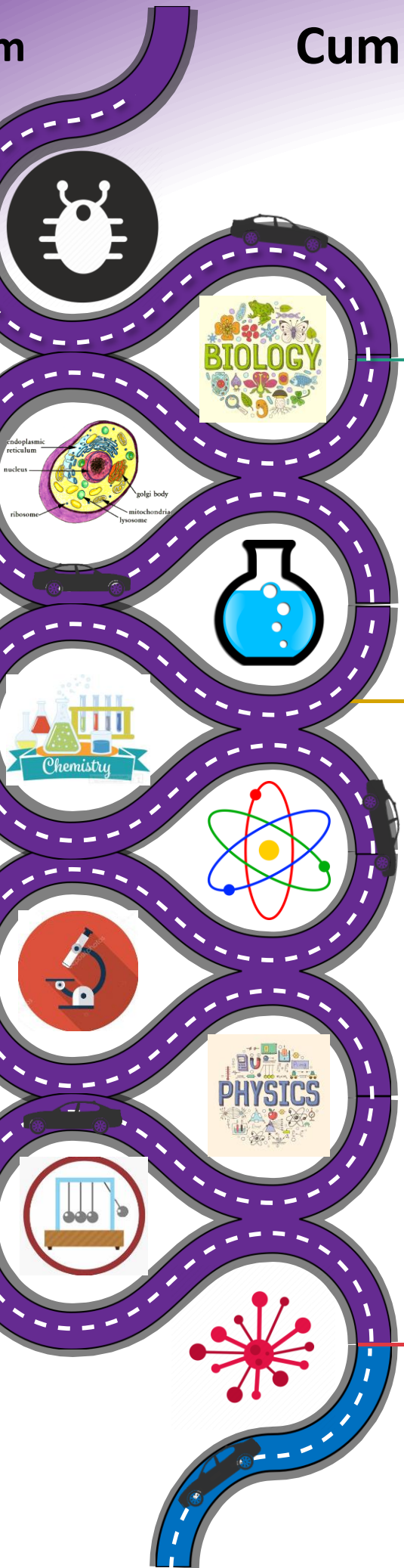
"DREAM BIG, WORK HARD, DON'T QUIT"

Biology Curriculum Year 7

Cumbria Futures Federation

KS2 recap

Students are give n a baseline test to assess their entry level to KS3. Our first chapter is to introduce science 1 skills, so students learn about variables, predicting, planning obtaining results, analyzing concluding and evaluating. These are all the fundamental skills needed for experiments.



1. B1.1 Cells

In this module students learn the foundations of biology and are introduced to cells. They will learn the main cell components and the functions and use microscopes to observe cells.

2. B2.2 Body functions

In this module students apply their understanding of cells to the levels of organisation in organisms and are introduced to the different body systems including the digestive, skeletal and respiratory systems.

3. B1.3 Reproduction

In this module students learn the foundations of biology and are introduced to the topic of reproduction. Students learn the process of reproduction in mammals including humans

4. B2.1 Health and lifestyle

In this module students learn about the importance of a healthy lifestyle and the risks of alcohol, drugs and smoking.

Progressing into year 8

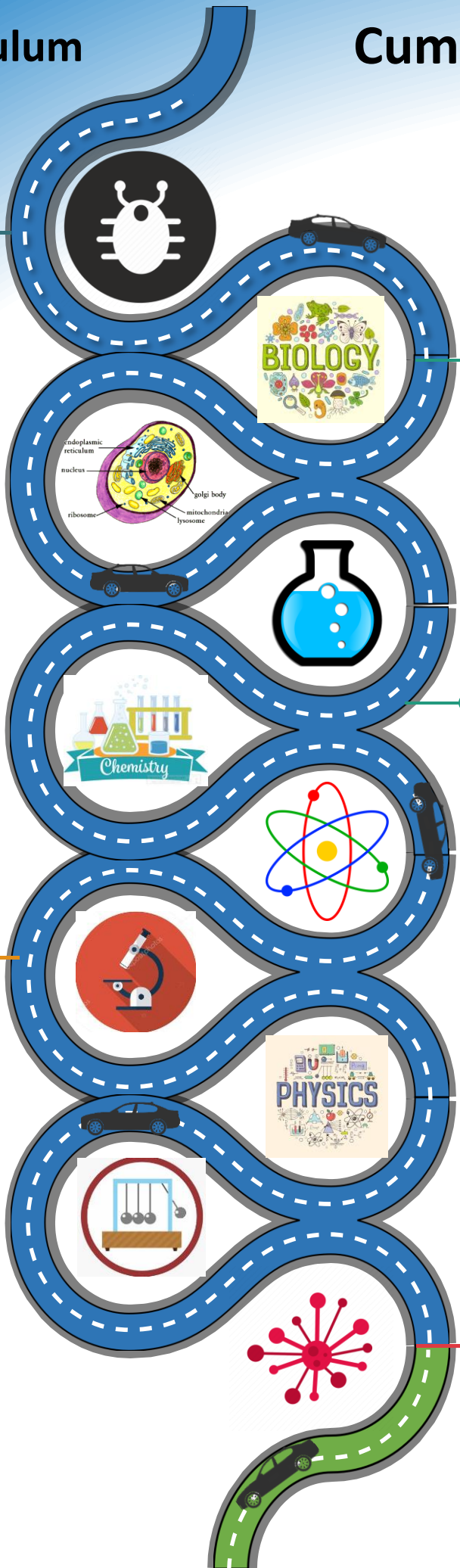
Students will complete an end of year assessment during exam week.

Biology Curriculum Year 8

Cumbria Futures Federation

Year 7 recap

Students again complete a short chapter about science 1 skills. students recap knowledge about variables, predicting, planning obtaining results, analyzing concluding and evaluating. These are all the fundamental skills needed for experiments



1.B2.1 Health and lifestyle

In this module students review and build on their knowledge from B2.1 Health and lifestyle introducing ideas about nutrition, exercise, enzymes and digestion while also recapping the risks of alcohol, drugs and smoking.

2. B2.2 Ecosystems

In this module students learn about the different parts of the ecosystem, feeding relationships between species and how plants and animals get their energy through photosynthesis and respiration.

3. B2.3 Adaptations, inheritance and extinction

In this module students learn about the processes of evolution, selective breeding, how animals are adapted to their environment and describe the evidence to support evolution and the way organisms are classified

Progressing into year 9

Students will complete an end of year assessment during exam week.

Biology Curriculum Year 9

Cumbria Futures Federation

Year 8 recap

Students begin their GCSE course in year 9. They start by returning to the topic of energy covered in the Y8 energy chapter. Building on their prior learning and knowledge from Y8.

1. B1 Cell structure and transport

In this chapter students review and build on their knowledge from the Y7 cells chapter. They build on their knowledge of plant and animal cells and are introduced to prokaryotic cells, scientific units and calculating magnification. They will also develop their practical skills by using a microscope to observe a range of different cells.

2. B2 Cell division

In this chapter students review and build on their knowledge from the Y8 adaptions, inheritance and extinction chapter. They build on their knowledge of inheritance to describe cell division, growth and differentiation in animals and plants.

3. B3 Organisation and digestive system

In this chapter students review and build on their knowledge from the Y8 health and lifestyle chapter. They build on their knowledge of the parts and functions of the digestive system by explaining how different factors affect enzyme activity and the role of bile in digestion

4. B4 Organising animals and plants

In this chapter students review and build on their knowledge from the Y7 cells chapter. They build on their knowledge of organ systems and diffusion to describe the transport systems and adaptions of organs in mammals and plants.

5. B5 Communicable disease

In this chapter students are introduced to the causes of communicable diseases, how they are spread and describe the body's defences to pathogens. This module then extends to look at the process of growing bacteria in the lab before introducing plant defence responses.

Progressing into year 10

Students will complete an end of year assessment created by the AQA exam board and aimed at assessing students knowledge of the Y9 chapters. Students will be graded in line with GCSE grades 1-9.

Biology Curriculum Year 10

Cumbria Futures Federation

Year 9 recap

Transition tests

1. B5 Communicable disease

In this chapter students are introduced to the causes of communicable diseases, how they are spread and describe the body's defences to pathogens. This module then extends to look at the process of growing bacteria in the lab before introducing plant defence responses.

2. B6 Preventing and treating diseases

In this chapter students evaluate the use of vaccinations, antibiotics and pain killers before describing how drugs are discovered and developed before use.

3. B7 Non communicable diseases

In this chapter students review and build on their knowledge from the communicable diseases chapter by learning the explaining risk factors associated with different non communicable diseases.

4. B8 Photosynthesis

In this chapter students review and build on their knowledge from y9 Organisation in animals and plants unity by describing how plants use glucose and explaining limiting factors for photosynthesis.

5. B9 Respiration

In this chapter students review and build on their knowledge from the organising plants and animals' chapters by comparing aerobic and anaerobic respiration.

6. B10 Human Nervous system

In this chapter students are introduced to the principles of homeostasis and the nervous system. This chapter then extends to study the brain and eye.

7. B11 Hormonal Coordination

In this chapter students build on their knowledge from the nervous system chapter by introducing the principles of hormonal control and its role in maintaining blood glucose levels and reproduction. This module then extends to look at hormonal control in plants.

8. B12 Homeostatsis in action

In this chapter students build on their knowledge from B10 the human nervous system and B11 hormonal co-ordination by describing the processes of temperature control and waste removal in the human body.

Progressing into year 11

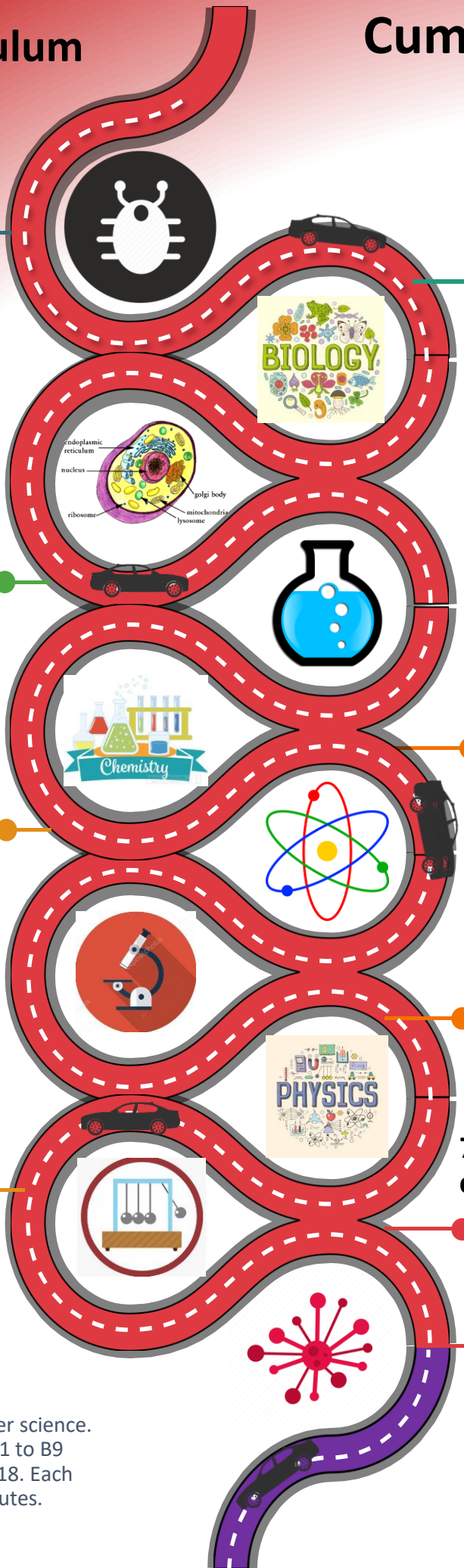
Students will complete an end of yea assessment which will be a previous Paper 1 from the AQA exam board and aimed at assessing students knowledge of the Y9/10 chapters. Students will be graded in line with GCSE grades 1-9.

Biology Curriculum Year 11

Cumbria Futures Federation

Year 10 Recap

Students will move onto the new chapters in the GCSE course. There will be an assessment during assessment week to aid our development and focus for revision sessions.



1. B12 Homeostasis in action

In this chapter students build on their knowledge from B10 the human nervous system and B11 hormonal co-ordination by describing the processes of temperature control and waste removal in the human body.

2. B13 Reproduction

In this chapter students review and build on their knowledge from the Y7 reproduction chapter by comparing sexual and asexual reproduction and introducing genetics.

3. B14 Variation and evolution

In this module students describe the processes of evolution, selective breeding, cloning and genetic engineering.

4. B15 Genetic and evolution

In this chapter students describe the evidence to support evolution and the process of speciation before moving on to the way organisms are classified.

5. B16 Adaption, inheritance and competition

In this chapter students review and build on their knowledge from the Y8 ecological relationships chapter by describing the factors that affect survival in a habitat.

6. B17 Organising an ecosystem

In this chapter students review and build on their knowledge from the Y8 ecological relationships Chapter by describing feeding relationships and material cycling in ecosystems

7. B18 biodiversity and ecosystems

In this chapter students analyse the impact f humans on the environment.

Exams

Students will sit 2 exams per science. Paper 1 in biology covers B1 to B9 and paper 2 covers P9 to P18. Each paper is 1 hour and 45 minutes.

Potential destinations

A level biology, Academic researcher, medicine, Biotechnologist, Higher education lecturer, Marine biologist, Microbiologist, Nanotechnologist, Nature conservation officer, Pharmacologist, Research scientist, zoologist, ecologist, veterinarian, dentist.

Science - Chemistry

INTENT- KS3

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SKILLS AND KNOWLEDGE

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7	**The particulate nature of matter:** Properties of the different states of matter, the particle model, gas pressure and changes of state **Atoms, elements and compounds:** simple (Dalton) atomic model; differences between atoms, elements and compounds; chemical symbols and formulae for elements and compounds; conservation of mass changes of state and chemical reactions. **Chemical reactions:** chemical reactions as the rearrangement of atoms; representing chemical reactions using formulae and using equations; combustion, thermal decomposition, oxidation and displacement reactions; defining acids and alkalis in terms of neutralisation reactions; the pH scale for measuring acidity/alkalinity; and indicators; reactions of acids with metals to produce a salt plus hydrogen; reactions of acids with alkalis to produce a salt plus water; catalysts **Energetics:** energy changes on changes of state (qualitative); exothermic and endothermic chemical reactions (qualitative).	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical techniques

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
8	**Pure and impure substances:** the concept of a pure substance; mixtures, including dissolving; diffusion in terms of the particle model; simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography; the identification of pure substances. **The Periodic Table:** varying physical and chemical properties of different elements; principles underpinning the Mendeleev Periodic Table; Periodic Table: periods and groups; metals and non-metals; how patterns in reactions can be predicted with reference to the Periodic Table; properties of metals and non-metals; chemical properties of metal and non-metal oxides with respect to acidity. **Materials:** order of metals and carbon in the reactivity series; use of carbon in obtaining metals from metal oxides; properties of ceramics, polymers and composites; Earth and atmosphere; composition and structure of the Earth; rock cycle and the formation of igneous, sedimentary and metamorphic rocks; Earth as a source of limited resources and the efficacy of recycling; the carbon cycle; composition of the atmosphere; production of carbon dioxide by human activity and the impact on climate	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical techniques

SKILLS AND KNOWLEDGE		
	Students will develop their KNOWLEDGE of	**Students will develop their SKILLS in**
9	**Atomic structure and the Periodic Table:** a simple model of the atom consisting of the nucleus and electrons, relative atomic mass, electronic charge and isotopes; number of particles in a given mass of a substance; modern Periodic Table, showing elements arranged in order of atomic number; position of elements in the Periodic Table in relation to their atomic structure and arrangement of outer electrons; properties and trends in properties of elements in the same group; characteristic properties of metals and non-metals; chemical reactivity of elements in relation to their position in the Periodic Table **Structure, bonding and the properties of matter:** changes of state of matter in terms of particle kinetics, energy transfers and the relative strength of chemical bonds and intermolecular forces; types of chemical bonding: ionic, covalent, and metallic; bulk properties of materials related to bonding and intermolecular forces; bonding of carbon leading to the vast array of natural and synthetic organic compounds that occur due to the ability of carbon to form families of similar compounds, chains and rings; structures, bonding and properties of diamond, graphite, fullerenes and graphene.	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical techniques

INTENT- KS4

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SKILLS AND KNOWLEDGE		
	Students will develop their KNOWLEDGE of	**Students will develop their SKILLS in**
10 & 11	**Chemical changes:** determination of empirical formulae from the ratio of atoms of different kinds; balanced chemical equations, ionic equations and state symbols; identification of common gases; the chemistry of acids; reactions with some metals and carbonates; pH as a measure of hydrogen ion concentration and its numerical scale; electrolysis of molten ionic liquids and aqueous ionic solutions; reduction and oxidation in terms of loss or gain of oxygen **Energy changes in chemistry:** Measurement of energy changes in chemical reactions; Bond breaking, bond making, activation energy and reaction profiles **Rate and extent of chemical change:** factors that influence the rate of reaction: varying temperature or concentration, changing the surface area of a solid reactant or by adding a catalyst; factors affecting reversible reactions. **Chemical analysis:** distinguishing between pure and impure substances; separation techniques for mixtures of substances: filtration, crystallisation, chromatography, simple and fractional distillation; quantitative interpretation of balanced equations; concentrations of solutions in relation to mass of solute and volume of solvent.	**The development of scientific thinking:** ways in which scientific methods and theories develop over time; using a variety of concepts and models to develop scientific explanations and understanding; appreciating the power and limitations of science and considering ethical issues which may arise; explaining everyday and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments; evaluating risks both in practical science and the wider societal context, including perception of risk; recognising the importance of peer review of results and of communication of results to a range of audiences. **Experimental skills and strategies:** using scientific theories and explanations to develop hypotheses; planning experiments to make observations, test hypotheses or explore phenomena; applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments; carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations; recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative; making and recording observations and measurements using a range of apparatus and methods; evaluating methods and suggesting possible improvements and further investigations.

SKILLS AND KNOWLEDGE

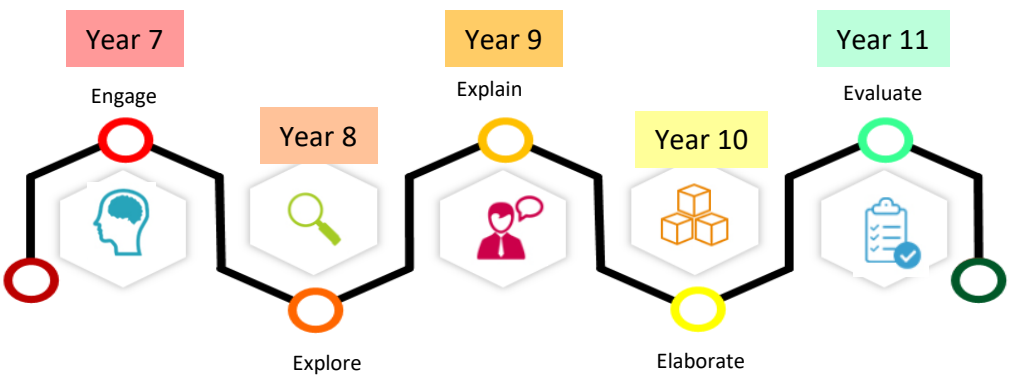
	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
10&11	**Chemical and allied industries:** life cycle assessment and recycling to assess environmental impacts associated with all the stages of a product's life; the viability of recycling of certain materials; carbon compounds, both as fuels and feedstock, and the competing demands for limited resources; fractional distillation of crude oil and cracking to make more useful materials; extraction and purification of metals related to the position of carbon in a reactivity series. **Earth and atmospheric science:** evidence for composition and evolution of the Earth's atmosphere since its formation; evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change; potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate; common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources; Earth's water resources and obtaining potable water.	**Analysis and evaluation:** applying the cycle of collecting, presenting and analysing data, including; presenting observations and other data using appropriate methods; translating data from one form to another; carrying out and representing mathematical and statistical analysis; representing distributions of results and making estimations of uncertainty; interpreting observations and other data, including identifying patterns and trends; making inferences and drawing conclusions; presenting reasoned explanations, including relating data to hypotheses; being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error; communicating the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations. **Vocabulary, units, symbols and nomenclature:** developing their use of scientific vocabulary and nomenclature; recognising the importance of scientific quantities and understanding how they are determined; using SI units and IUPAC chemical nomenclature unless inappropriate; using prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano); interconverting units; using an appropriate number of significant figures in calculations.

OVERVIEW

Qualification gained by the end of year 11: GCSE in Chemistry

Whole school vision links developed in this subject	After school destinations linked to this subject	
• Allowing student to be encouraged in their learning by providing a safe learning environment so they can be ambitious and achieve above and beyond • British values through mutual respect • Inclusive for all- same setting but differentiated work. • Supporting local providers	Analytical Chemist Accountant/ Auditor Chemical Engineer Chemical Development Engineer Lecturer Environmental Chemist Forensic Researcher	Forensic Scientist Patent Agent Purification Scientist Toxicologist

Science CURRICULUM THEMES



Cross Curriculum links in Science

- Geography- rock cycle,
- Maths- calculations, graphs
- History- history of periodic table/ atom
- PE- anatomy & lifestyle
- English- literacy
- CA- field science

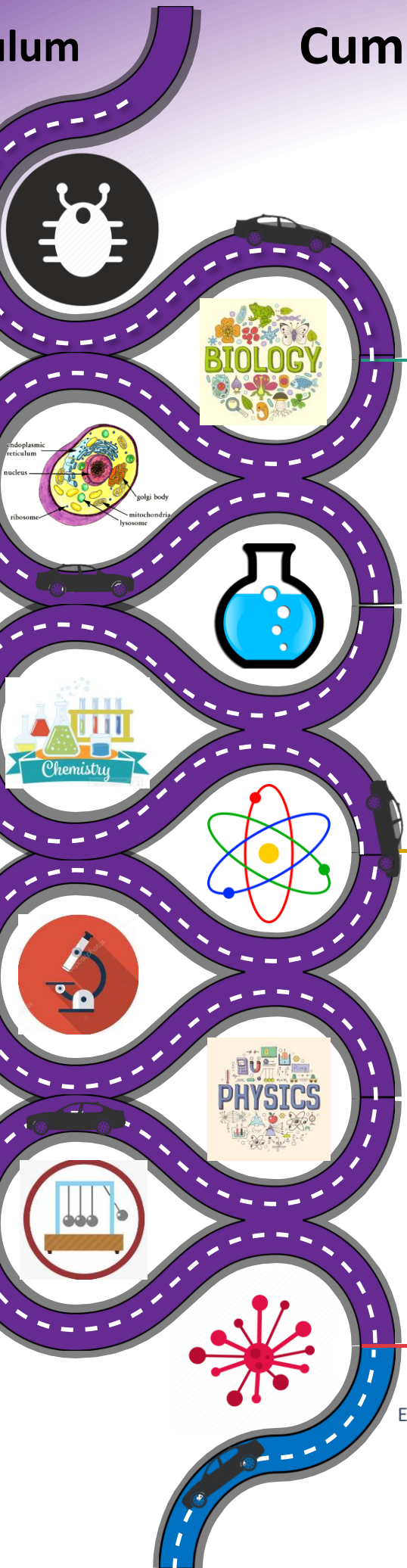
"DREAM BIG, WORK HARD, DON'T QUIT"

Chemistry Curriculum Year 7

Cumbria Futures Federation

KS2 recap

Students are give n a baseline test to assess their entry level to KS3. Our first chapter is to introduce science 1 skills, so students learn about variables, predicting, planning obtaining results, analyzing concluding and evaluating. These are all the fundamental skills needed for experiments.



1. C1.1 Particles

In this chapter students build on the changing state chapter from year 7 and are introduced to the concept of particles and the properties of solids, liquids and gases.

2. C1.2 Atoms, elements and compounds

In this chapter students learn about the basics of chemistry, what atoms are, what they make (elements), how they make compounds and chemical formula.

3. C1.3 Metal reactions

In this chapter students learn the foundations of chemistry and are introduced to simple chemical reactions. They also learn the basics of acids and alkalis and the pH scale

4. C1.4 Acids & Alkali

In this chapter students learn about acids and alkali's, their properties, how to test for them in chemicals, neutralize them by making salts which is linked to GCSE chemistry and using the pH scale.

Progressing into year 8

End of year assessment

Chemistry Curriculum Year 8

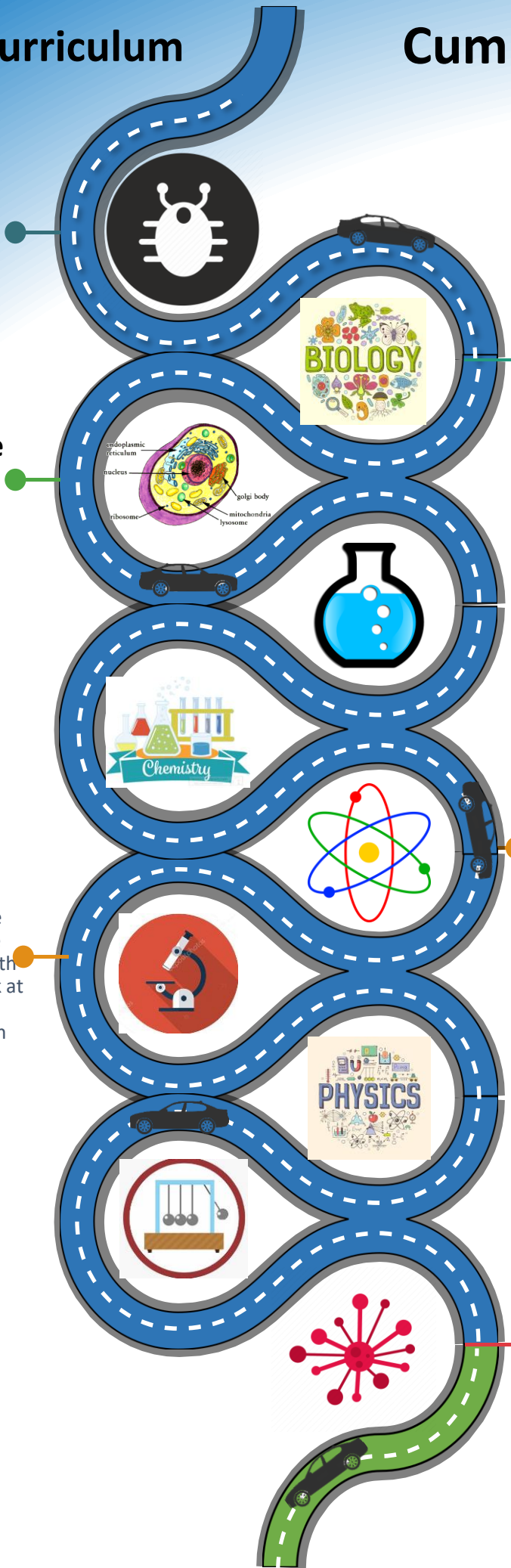
Cumbria Futures Federation

Year 7 recap

Students again complete a short chapter about science 1 skills. students recap knowledge about variables, predicting, planning obtaining results, analyzing concluding and evaluating. These are all the fundamental skills needed for experiments.

2. C2.2 Pure and impure Substance

In this chapter students learn the foundations in chemistry and are introduced to the particle theory and use it identify pure and impure substances from particle diagrams and describe different separation techniques



1.C2.1 Periodic table

In this chapter students review and build on their knowledge from the Particles and Reactions chapters and are introduced to the periodic table and how it links to the physical and chemical properties of elements and their compounds.

4. C2.4 Earth and atmosphere

In this chapter students are introduced to the structure and composition of the Earth before moving onto to look at the carbon cycle and the effects of human activity on the environment.

3. C2.3 Metal reactions

In this chapter students review and build on their knowledge from the Reactions and Periodic table chapters and learn about the properties of metals.

Progressing into year 9

End of year test

Chemistry Curriculum Year 9

Cumbria Futures Federation

Year 8 recap

Students begin their GCSE course in year 9. Building on their prior learning and knowledge from Y7 & Y8.

1. C1 Atomic Structure

In this chapter students build on their knowledge from the particles and periodic table chapters by developing their understanding of atoms

2. C2 Periodic table

In this chapter students review and build on their knowledge from the particles and periodic table chapters by describing the development of the periodic table and the trends in the properties of elements across the periodic table.

3. C3 Structure and bonding

In this chapter students review and build on their knowledge from chapter 1, atomic structure and chapter 2, periodic table by describe different types of bonding and explaining the properties of ionic compounds, covalent compounds and metals. The concepts of nanoparticles is introduced

4. C4 Chemical Calculations

In this chapter students review and build on their knowledge from the chapter 1 atomic structure and chapter 2 periodic table by calculating atomic mass and relative formula mass, before going onto learn about moles. This chapter also reviews and builds on the chemical reactions chapter from KS3 through titration experiments

5. C5 Chemical Changes

In this chapter students review and build on their knowledge from the chemical reactions, reactivity and Energetics chapters by explaining how the extraction of a metal from its ore depends on the reactivity of the metal and using ionic equations for neutralisation reaction

Progressing into year 10

End of year exams

Chemistry Curriculum Year 10

Cumbria Futures Federation

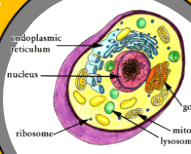
Year 9 recap

Transition test

1. C6 Electrolysis

In this chapter students review and build on their knowledge from the reactivity chapter and are introduced to electrolysis.

2. C7 Energy Changes



In this chapter students review and build on their knowledge from the energetics chapter and draw reaction profile diagrams and complete bond energy calculations.

3. C8 Rates and equilibrium

In this chapter students review and build on their knowledge from the energetics chapter by investigating and explaining how different factors affect the rate of chemical reactions.

4. C9 Crude oil and fuels

In this chapter students review and build on their knowledge from the energy, particles and energetics chapters by describing hydrocarbon fuels and how they are obtained from crude oil.

5. C10 Organic reactions

In this chapter students review and build on their knowledge from the crude oils and fuels chapter by learning the foundations of organic chemistry.

6. C11 Polymers

In this chapter students review and build on their knowledge from the crude oils and fuels chapter by describing polymerisation reactions.

Progressing into year 11

End of year tests, preparation for revision and mock exams.

Chemistry Curriculum Year 11

Cumbria Futures Federation

Year 10 Recap

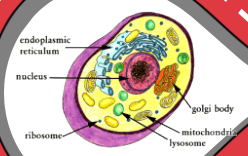
Transition tests, preparation revision and mock exams.

1. C11 Polymers

In this chapter students review and build on their knowledge from the crude oils and fuels chapter by describing polymerisation reactions.

2. C12 Chemical analysis

In this chapter students review and build on their knowledge from the chapter by describing methods used to analyse chemicals.



3. C13 Earths atmosphere

In this chapter students review and build on their knowledge from the Materials and the Earth chapter by explaining the change so in the composition of the Earth's atmosphere.

4. C14 The earths resources

In this chapter students review and build on their knowledge from the Materials and the Earth chapter by describing the processing methods of different resources obtained from the Earth.

5. C15 Using our resources

In this chapter students build on their knowledge from The Earth's resources by describing the production of ammonia via the Haber cycle.

6. Revision

Once all content has been completed, students will start revision for their GCSE's. This will be a mixture of all 3 sciences, they will also complete mini assessments. Revision is tailored to the students requirements (what they believe they need to revise) as well as what we believe they need more work on.

6. Exams

Students will sit 2 exams per science. Paper 1 in chemistry covers C1 to C6 and paper 2 covers C7 to C15. Each paper is 1 hour and 15 minutes.

Potential destinations

Careers in chemistry: Analytical Chemist, Accountant/ Auditor, Chemical Engineer, Chemical Development Engineer, Lecturer, Environmental Chemist, Forensic Researcher, Forensic Scientist, Patent Agent, Purification Scientist, Toxicologist

Science – Physics

INTENT- KS3

We create a positive and safe learning environment, where students feel confident to explore ideas surrounding science. KS3 is about students finding their feet, learning the foundations and skills that are required by excellent scientists. In year 7 we start learning about cells, atoms and forces, the essential building blocks for building the knowledge in our science curriculum. Science is a hierarchical subject, where success in each of the three specialisms is reliant on mastery of all that sits below. The principal focus of science teaching in KS3 is to develop a deeper understanding of a range of scientific ideas in the subject disciplines of biology, chemistry and physics. Pupils should begin to see the connections between these subject areas and become aware of some of the big ideas underpinning scientific knowledge and understanding.
Our intent is to ensure that students have a developed understanding of the World and Universe they live in, allowing them to be successful in any route they choose; providing opportunity for academic or personal success within the Sciences, or wider career network. We are inclusive with all of our students within the KS3 curriculum, learning essential practical and team work skills encouraging students to develop scientific enquiry skills to explore the world around them.

SKILLS AND KNOWLEDGE

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
7	**Forces:** forces as pushes or pulls; using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces; moment; forces: deforming objects; stretching and squashing – springs; friction between surfaces; resistance to motion of air and water; forces measured in newtons, measurements of stretch or compression as force is changed; force-extension linear relation; Hooke's Law; work done and energy changes on deformation; non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets. **Balanced forces:** opposing forces and equilibrium; weight held by stretched spring or supported on a compressed surface; Forces and motion; forces needed stop or start moving, or change speed or direction. **Observed waves:** waves on water which travel through water with transverse motion; these can be reflected, add or cancel – superposition. **Sound waves:** frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound; sound needs a medium to travel, the speed of sound in air, water, solids; sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal; auditory range of humans and animals. **Light waves:** similarities and differences between light waves and waves; light waves travelling through a vacuum; speed of light; the transmission of light through materials: absorption, diffuse scattering and specular reflection; use of ray model to explain imaging in mirrors, pinhole camera, refraction of light and action of convex lens in focusing; the human eye; light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras; colours and the different frequencies of light, white light and prisms; differential colour effects in absorption and diffuse reflection. **Space physics:** gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun; our Sun as a star, other stars in our galaxy, other galaxies; the seasons and the Earth's tilt, day length at different times of year, in different hemispheres; the light year as a unit of astronomical distance.	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical techniques

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
8	**Current electricity:** electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge; potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current; differences in resistance between conducting and insulating components. **Static electricity:** separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects; the idea of electric field, forces acting across the space between objects not in contact. **Magnetism:** magnetic poles, attraction and repulsion; magnetic fields by plotting with compass, representation by field lines; Earth's magnetism, compass and navigation; the magnetic effect of a current, electromagnets, D.C. motors (principles only). **Physical changes:** conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving; similarities and differences, including density differences, between solids, liquids and gases; Brownian motion in gases; diffusion in liquids and gases driven by differences in concentration; the difference between chemical and physical changes. **Particle model:** differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition; atoms and molecules as particles. **Energy in matter:** changes with temperature in motion and spacing of particles; internal energy stored in materials. **Energy and waves:** pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound; waves transferring information for conversion to electrical signals by microphone. **Energy:** Calculation of fuel uses and costs in the domestic context; comparing energy values of different foods (kJ); comparing power ratings of appliances in watts (W, kW); comparing amounts of energy transferred (J, kJ, kW hour); domestic fuel bills, fuel use and costs; fuels and energy resources. **Energy changes and transfers:** simple machines give bigger force but at the expense of smaller movement: product of force and displacement unchanged; heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference: use of insulators; processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels. **Changes in systems:** energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change; comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions; using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes. **Describing motion:** speed and the relationship between average speed, distance and time (speed = distance ÷ time); the representation of a journey on a distance-time graph; relative motion. **Pressure in fluids:** atmospheric pressure, decreases with increase of height as weight of air above decreases with height; pressure in liquids, increasing with depth; upthrust effects, floating and sinking; pressure measured by ratio of force over area – acting normal to any surface.	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical techniques

SKILLS AND KNOWLEDGE

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
9	**Energy:** energy changes in a system involving heating, doing work using forces, or doing work using an electric current; calculating the stored energies and energy changes involved; power as the rate of transfer of energy; conservation of energy in a closed system; dissipation; calculating energy efficiency for any energy transfers; renewable and non-renewable energy sources used on Earth; changes in how these are used. **Electricity:** measuring resistance using p.d. and current measurements; exploring current, resistance and voltage relationships for different circuit elements, including their graphical representations; quantity of charge flowing as the product of current and time; drawing circuit diagrams; exploring equivalent resistance for resistors in series; domestic a.c. supply; live, neutral and earth mains wires; safety measures; power transfer related to p.d. and	**Scientific attitudes**: pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility; understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review; evaluate risks. **Experimental skills and investigations**: ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience; make predictions using scientific knowledge and understanding; select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate; use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety; make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements; apply sampling techniques. **Analysis and evaluation:** apply mathematical concepts and calculate results; present observations and data using appropriate methods, including tables and graphs; interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions; present reasoned explanations, including explaining data in relation to predictions and hypotheses ; evaluate data, showing awareness of potential sources of random and systematic error; identify further questions arising from their results. **Measurement:** understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature; use and derive simple equations and carry out appropriate calculations; undertake basic data analysis including simple statistical techniques

INTENT- KS4

Our KS4 curriculum builds on the strong foundations that students have set up themselves in KS3. Teaching the sciences in KS4 continues with the process of building upon and deepening scientific knowledge and the understanding of ideas developed in earlier key stages in the subject disciplines of biology, chemistry and physics. For some students, studying the sciences in key stage 4 provides the platform for more advanced studies, establishing the basis for a wide range of careers. For others, it will be their last formal study of subjects that provide the foundations for understanding the natural world and will enhance their lives in an increasingly technological society.
Science is changing our lives and is vital to the world's future that all students should be taught essential aspects of the knowledge, methods, processes and uses of science. They should be helped to appreciate the achievements of science in showing how science has evolved with time. The sciences taught are linked to different careers in the scientific world. We are inclusive of all students providing triple science for all and differentiating these disciplines to allow all to succeed, this includes the addition of entry level certificate.

SKILLS AND KNOWLEDGE

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
10 & 11	**Forces:** forces and fields: electrostatic, magnetic, gravity; forces as vectors; calculating work done as force x distance; elastic and inelastic stretching; pressure in fluids acts in all directions: variation in Earth's atmosphere with height, with depth for liquids, up-thrust force **Forces and motion:** speed of sound; estimating speeds and accelerations in everyday contexts; interpreting quantitatively graphs of distance, time, and speed; acceleration caused by forces; Newton's First Law; weight and gravitational field strength; decelerations and braking distances involved on roads. **Wave motion:** amplitude, wavelength and frequency; relating velocity to frequency and wavelength; transverse and longitudinal waves; electromagnetic waves and their velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays; velocities differing between media: absorption, reflection, refraction effects; Production and detection, by electrical circuits, or by changes in atoms and nuclei; uses in the radio, microwave, infra-red, visible, ultra-violet, X-ray and gamma-ray regions, hazardous effects on bodily tissues. **Magnetism and electromagnetism:** Exploring the magnetic fields of permanent and induced magnets, and the Earth's magnetic field, using a compass; Magnetic effects of currents; how solenoids enhance the effect; how transformers are used in the national grid and the reasons for their use.	**The development of scientific thinking:** ways in which scientific methods and theories develop over time; using a variety of concepts and models to develop scientific explanations and understanding; appreciating the power and limitations of science and considering ethical issues which may arise; explaining everyday and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments; evaluating risks both in practical science and the wider societal context, including perception of risk; recognising the importance of peer review of results and of communication of results to a range of audiences. **Experimental skills and strategies:** using scientific theories and explanations to develop hypotheses; planning experiments to make observations, test hypotheses or explore phenomena; applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments; carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations; recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative; making and recording observations and measurements using a range of apparatus and methods; evaluating methods and suggesting possible improvements and further investigations.

SKILLS AND KNOWLEDGE

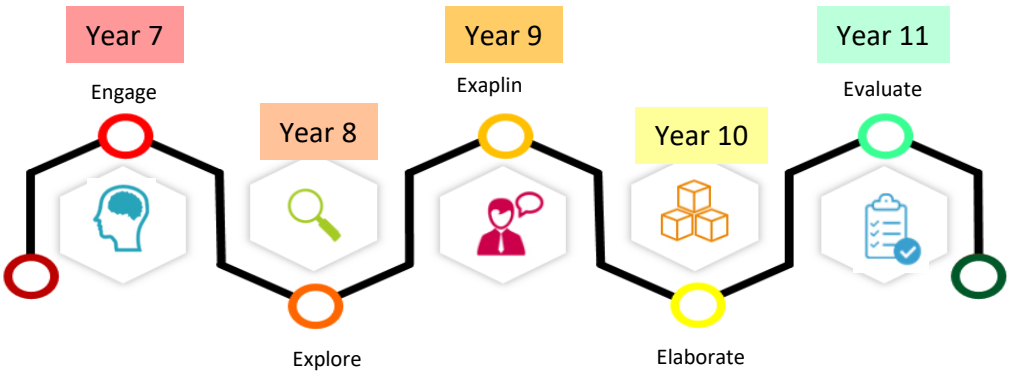
	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
10 & 11	**The structure of matter:** relating models of arrangements and motions of the molecules in solid, liquid and gas phases to their densities; melting, evaporation, and sublimation as reversible changes; calculating energy changes involved on heating, using specific heat capacity; and those involved in changes of state, using specific latent heat; links between pressure and temperature of a gas at constant volume, related to the motion of its particles (qualitative). **Atomic structure:** nuclear model and its development in the light of changing evidence; masses and sizes of nuclei, atoms and small molecules; differences in numbers of protons and neutrons related to masses and identities of nuclei; isotope characteristics and equations to represent changes; ionisation; absorption or emission of radiation related to changes in electron orbits; radioactive nuclei; emission of alpha or beta particles, neutrons, or gamma-rays, related to changes in the nuclear mass and/or charge; radioactive materials, half-life, irradiation, contamination and their associated hazardous effects; waste disposal; nuclear fission, nuclear fusion and our Sun's energy **Space physics:** main features of the solar system	**Analysis and evaluation:** applying the cycle of collecting, presenting and analysing data, including; presenting observations and other data using appropriate methods; translating data from one form to another; carrying out and representing mathematical and statistical analysis; representing distributions of results and making estimations of uncertainty; interpreting observations and other data, including identifying patterns and trends; making inferences and drawing conclusions; presenting reasoned explanations, including relating data to hypotheses; being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error; communicating the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations. **Vocabulary, units, symbols and nomenclature:** developing their use of scientific vocabulary and nomenclature; recognising the importance of scientific quantities and understanding how they are determined; using SI units and IUPAC chemical nomenclature unless inappropriate; using prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano); interconverting units; using an appropriate number of significant figures in calculations.

OVERVIEW

Qualification gained by the end of year 11: GCSE in Physics

Whole school vision links developed in this subject	After school destinations linked to this subject	
• Allowing student to be encouraged in their learning by providing a safe learning environment so they can be ambitious and achieve above and beyond • British values through mutual respect • Inclusive for all- same setting but differentiated work. • Supporting local providers	A'level physics Astronomer Clinical scientist Medical physics Geophysicist Higher education lecturer Meteorologist Nanotechnologist Sound engineer	Radiation protection practitioner Research scientist (physical sciences) Secondary school teacher Technical author

Science CURRICULUM THEMES



Cross Curriculum links in science

- Geography- rock cycle,
- Maths- calculations, graphs
- History- history of periodic table/ atom
- PE- anatomy & lifestyle
- English- literacy
- CA- field science

"DREAM BIG, WORK HARD, DON'T QUIT"

Physics Curriculum Year 7

Cumbria Futures Federation

KS2 recap

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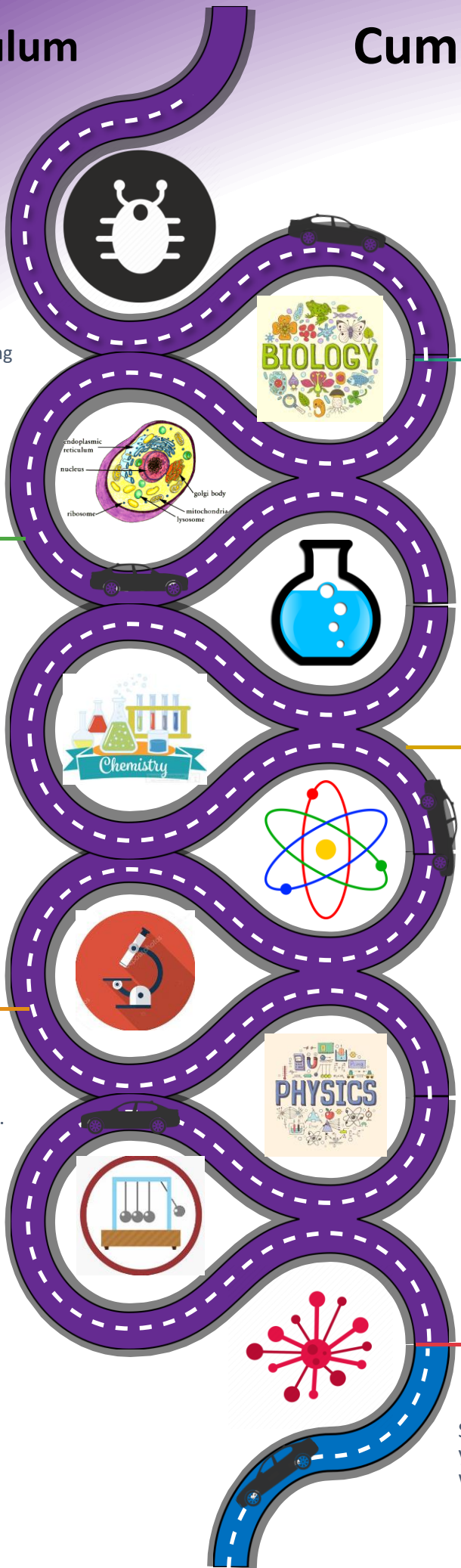


1. P1.1 Forces

In this chapter students learn the foundations of physics and are introduced to forces and force diagrams. They learn about interactive force pairs and Hooke's law.

2. P1.2 Sound

This chapter looks at how sounds are made and the different features of sound and sound waves.

3. P1.3 Light

This chapter introduces the concept of light and looks at simple behaviours of light like reflection and refraction.

4. P1.4 Space

In this chapter Students look at the structure of the solar system, phases of the moon, the seasons and the night sky.

Progressing into year 8

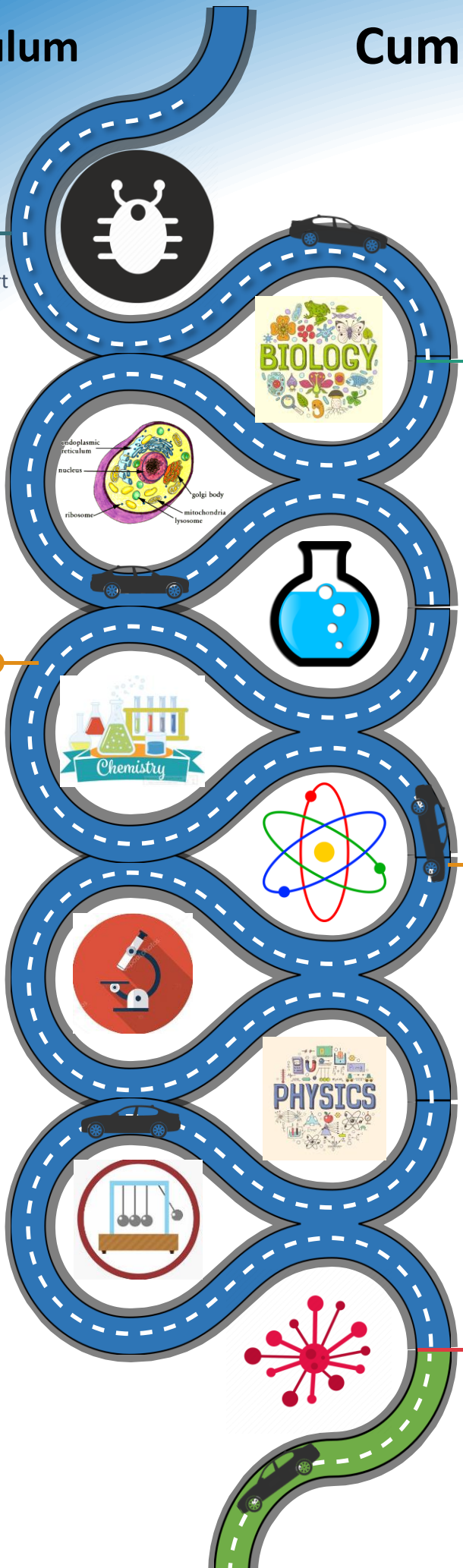
Students will complete an end of year assessment during exam week.

Physics Curriculum Year 8

Cumbria Futures Federation

Year 7 recap

Students again complete a short chapter about science 1 skills. students recap knowledge about variables, predicting, planning obtaining results, analyzing concluding and evaluating. These are all the fundamental skills needed for experiments.



1. P2.1 Electricity and magnesium

This module looks at conductors and insulators and basic series and parallel circuits. The students then move on to study magnetism and electromagnets.

2. P2.2 Energy

In this module students learn the foundations of physics and introduces the energy store model and the mechanisms of transfer between different energy stores.

3. P2.3 Motion and pressure

In this chapter students learn about pressure in solids, liquids and gases. They also learn to calculate speed and interpret distance-time graphs.

Progressing into year 9

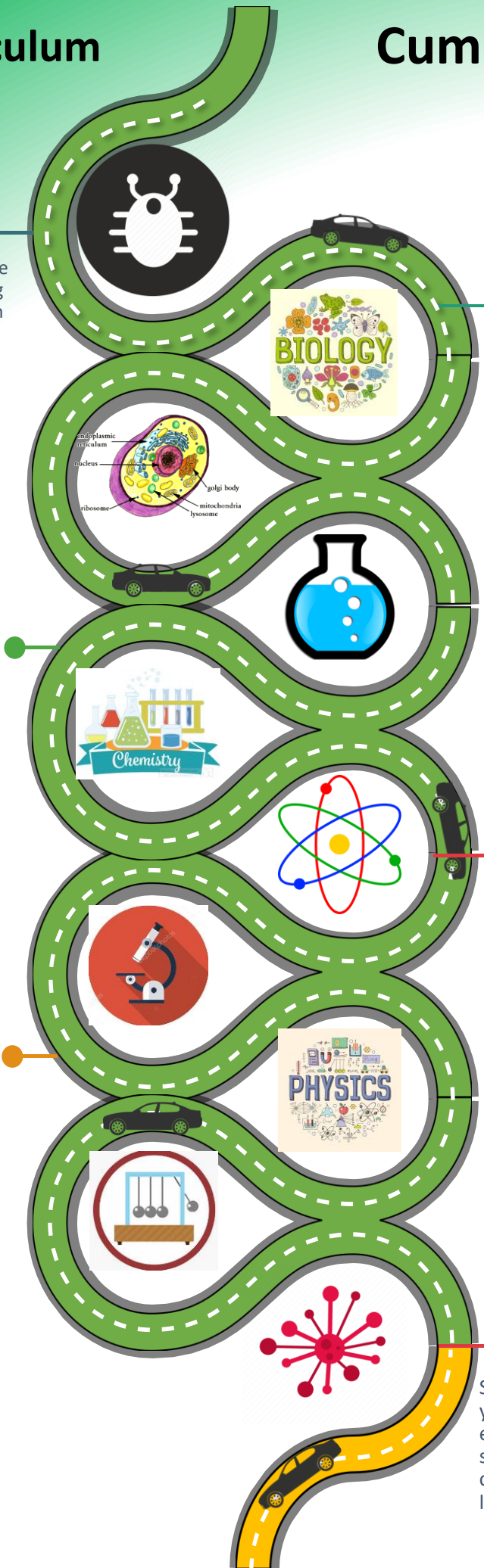
Students will complete an end of year assessment during exam week.

Physics Curriculum Year 9

Cumbria Futures Federation

Year 8 recap

Students begin their GCSE course in year 9. They start by returning to the topic of energy covered in the Y8 energy chapter. Building on their prior learning and knowledge from Y8.



1. P1 conservation and dissipation of energy

In this chapter students review and build on their knowledge from the Y8 energy chapter. They build on their knowledge of energy store model sand the mechanisms of transfer between different energy stores and learn to calculate different energy values like kinetic energy and gravitational potential.

2. P2 Energy transfer by heating

In this chapter students build further on their knowledge from the Y8 energy chapter, by looking at heat energy transfer and applying it to heating and insulating of buildings a. This chapter also introduces the concept of specific heat capacity.

3. P3 Energy Resources

In this module students build on their knowledge from the Y8 energy chapter by learning about how electricity is produced via renewable and non-renewable energy resources, as well as evaluating these different methods of meeting the nation's energy demands

4. P4 Electrical Circuits

In this chapter students review and build on their knowledge from the Y8 Electricity and magnetism chapter by describing static electricity before describing electrical fields and investigating the relationship between current, potential difference and resistance in different components.

Progressing into year 10

Students will complete an end of year assessment created by the AQA exam board and aimed at assessing students knowledge of the Y9 chapters. Students will be graded in line with GCSE grades 1-9.

Physics Curriculum Year 10

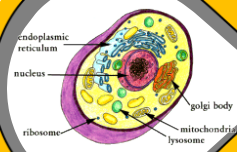
Cumbria Futures Federation

Year 9 recap

Transition tests

1. P6 Molecules and energy

In this chapter students review and build on their knowledge from the Y8 chapter s Matter and pressure and motion. They are introduced to the concept of internal energy and specific latent heat, alongside describing the relationships between gas pressure and temperature from the



2. P7 Radioactivity

In this chapter students are introduced to nuclear radiation by describing the different types of nuclear radiation and calculating half-life.

3. P8 Forces in balance

In this chapter students review and build on their knowledge from the Y7 forces and Y8 motion and pressure chapters, by introducing vectors and resolving forces.

4. P9 Motion

In this Chapter students review and further improve their knowledge from the Y7 forces and Y8motion and pressure chapters by calculating velocity and acceleration and analysing motion graphs.

5. P10 Forces and Motion

In this chapter students review and build on their knowledge from the Y7 forces and y8 motion and pressure chapters by calculating velocity and acceleration and analysing motion graphs including velocity-time graphs.

Progressing into year 11

Students will complete an end of year assessment which will be a previous Paper 1 from the AQA exam board and aimed at assessing students knowledge of the Y9/10 chapters. Students will be graded in line with GCSE grades 1-9.

Physics Curriculum Year 11

Cumbria Futures Federation

Year 10 Recap

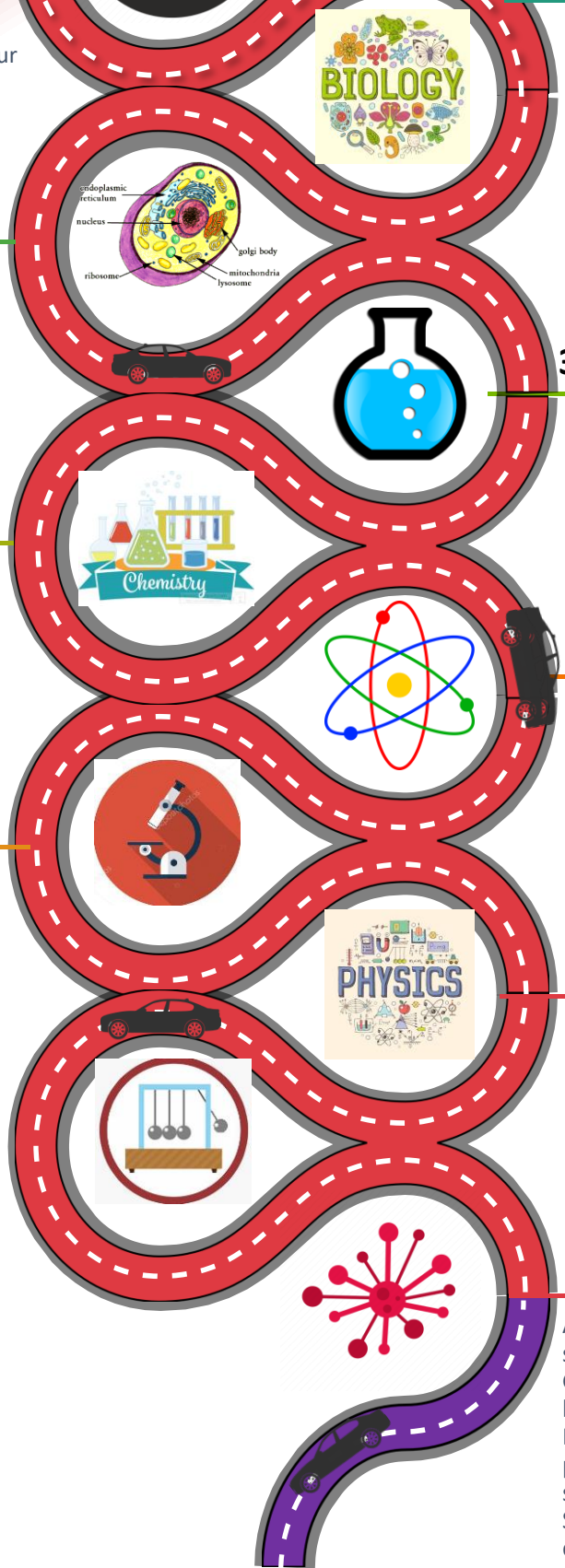
Students will move onto the new chapters in the GCSE course. There will be an assessment during assessment week to aid our development and focus for revision sessions.

1. P10 Forces and motion

In this chapter students further build on their knowledge from the Y7 forces and Y8 motion and pressure chapters, by describing the effect of forces acting on a falling body, during braking and introducing the concept of momentum. This module then extends to study the conservation of momentum in car safety.

2. P11 Forces and pressure

In this module students extend on their knowledge from the Y8 chapters matter and motion and pressure by further extending their knowledge of pressure on liquids and gases.



3. P12 Wave Properties

In this chapter students review and build on their knowledge from the Y7 light and sound chapters by looking at the nature and behaviour of waves.

4. P13 EM waves

In this chapter students review and build on their knowledge from the Y7 Light and space chapters by describing the electromagnetic spectrum and its uses

5. P14 Light

In this chapter students review and build on their knowledge from Y7 light chapter. Students extend their knowledge to different types of lenses and their uses.

6. P15 Electromagnetism

In this module students review and build on their knowledge from the Y8 chapter electricity and magnetism ,extending their prior knowledge to understanding and explaining the motor effect.

7. P16 Space

In this chapter students review and build on their knowledge from the Y7 Light and space chapters by describing the origin and future of the universe and the evidence supporting it.

Exams

Students will sit 2 exams per science. Paper 1 in physics covers P1 to P7 and paper 2 covers P8 to P16. Each paper is 1 hour and 15 minutes.

Potential destinations

A'level physics, Astronomer, Clinical scientist, medical physics, Geophysicist, Higher education lecturer, Meteorologist, Nanotechnologist, Radiation protection practitioner, Research scientist (physical sciences), Secondary school teacher, Sound engineer, Technical author