Birchwood Community High School

Year 9 curriculum journey

Know more and remember more. Our scheme of work is based around three distinct disciplines: biology, chemistry, and physics. The scheme of work is ambitious as it attempts to connect science as a subject to the natural world around them. We offer the chance for pupils to understand living matter and how all-living organisms interact, the particulate model to understand how particles behave, energy and the importance of using it wisely and how particles interact in advantageous and disadvantageous ways. We have structured our scheme of work so that pupils of all abilities have the chance to study key concepts at depth before moving on to more challenging content and have designed a true spiral curriculum. Our scheme of work is designed to link new subject content to previously taught key concepts. This allows pupils to develop their understanding of the key concepts by recalling, and adding to, their existing schema.

Understand the methodology of science: Pupils will begin to understand that nature and processes of science. We start by actively encouraging inquisitive thought and seek to engage pupils by getting them to ask scientific questions about the world around them. The scheme of work then offers the chance to learn about how we begin to answer the questions asked through observation, testing and evaluation. Pupils will develop key practical skills that are interwoven within a well sequenced curriculum.

Be able to use science for future life: In today's modern world there are numerous articles using 'data' to back a particular agenda. This comes from multiple sources, some to be trusted and some to be questioned. Pupils will have the ability to critically evaluate evidence and have the confidence to have conviction in their understanding of the data provided. Pupils will have the ability to articulate scientific thought and the ability to solve problems through logical thought process. This will allow pupils to make informed choices throughout the rest of their lives.

Curriculum sequencing: The science curriculum typically delves deeper into specific areas of study that are *key concepts,* this provides a more detailed exploration and deeper understanding of 'Big Ideas in Science', compared to the broader scope of the NC**.** Our sequencing and content are influenced on BEST* and their key concepts in science. We have derived this schema from planning forward across the keys stage 1,2,3 and 4 programmes of study to ensure coverage, depth, and breadth of the science curricula.

* Links to prior learning and embedding foundations for future learning. *Programme of study coverage

* Links to BEST

Science: The Birchwood Way

Topic: Energy stores and calculations	How can we calculate energy?

Key schema: What is delivered?

-Renewable and non-renewable energy
-Calculating the cost of energy
-Comparing energy values
-Comparing power ratings
-Calculating work done

Why is this being taught now?

Students have been taught about energy stores and pathways of the same half term in year 7 and then focused upon thermal energy transfers in half term 1 of year 8. Our spiral curriculum bridges this knowledge in preparation for GSCE and builds upon prior knowledge.

Where Programme of study is met.

-Comparing energy values of different foods (from labels) (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.

Building schema- Why is this important?

This unit builds upon energy transfers in year 7, thermal transfers in year 8 and prepares students for Physics at KS4 and using equations to understand and calculate energy.

BEST: Topic 1 Air pollution

Topic 2 water cycle

Topic 5- Changing atmosphere

Science: The Birchwood Way

Topic: Earths resources and sustainability	How are humans impacting our planet?

Key schema: What is delivered?

-Earth as a source of limited resources and the efficacy of recycling
-The carbon cycle
-The composition of the atmosphere
-The production of carbon dioxide by human activity and the impact on climate.

Why is this being taught now?

This unit will develop the students understanding of the Earth's atmosphere and how human activity is affecting it. They will begin by looking at the composition of the Earth's atmosphere. They will then move onto the carbon cycle and how carbon atoms are cycled between the atmosphere and the ground/oceans/organic life. The impact of combustion on the carbon cycle will then be studied with particular focus on the causes of climate change and potential solutions to this problem. This can be linked to energy waste and impact on the atmosphere.

Where Programme of study is met.

-The composition of the Earth
-The structure of the Earth
-Earth as a source of limited resources and the efficacy of recycling
-The carbon cycle
-The composition of the atmosphere
-The production of carbon dioxide by human activity and the impact on climate.

Building schema- Why is this important?

How layers to our planet are different compositions.

Humans are affecting the carbon cycle and causing climate change building upon knowledge of acids in year 7 and their corrosive properties and how human interaction with the earth and the environment are causing change. Genetic information and the environment affect features and growth of organisms.
Acid rain: Key concept 1
Chemical weathering key concept 2
Changing atmosphere key concept 1

Science: The Birchwood Way

Topic: Inheritance and variation	How does the breathing systems enable the survival of an organism?

Key schema: What is delivered?

-Heredity as the process by which genetic information is transmitted from one generation to the next
- A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model -Differences between species
-The variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation
-The 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.

Why is this being taught now?

This unit will teach the students about variation and how genetic information is passed from generation to generation. It will begin by looking at the variation that exists within humans and the reasons for any variation. Data will be collected from the class. This will then allow the students to study continuous and discontinuous variation and also provide an opportunity for the students to practise their graph skills. From here the students will move onto DNA. They will look at its structure, organisation and the history of its discovery. Lesson 5 provides an opportunity to look at factors that may impact the acceptance and recognition of work carried out by scientists (gender/race/scientific specialism). From here the students will move onto heredity and the basic processes involved in genetic transmission. Sexual and asexual reproduction (first studied in Year 7) will be revisited. The mechanism that underpins the inheritance of biological sex will be looked at and the parent responsible for your biological sex identified. The processes of natural selection and artificial selection will be discussed. Finally, the unit will end by looking at the topics of gene banks. The function of gene banks as biodiversity dwindles will be explained.

Where programme of study is met.

-Inheritance
-Chromosomes, DNA and genes
-The work of Franklin, Watson and Crick
-Modelling DNA and the development of the DNA model
-Difference between organisms
-Natural selection
-Evolution and extinction
-Biodiversity
-Interleaving SK4 Punnet squares and monohybrid diagrams

Building schema- Why is this important?

Students have studied cells and organs systems in half term 2 of year 7 and respiration and breathing in year 8. This unit delves into understanding our inherited variations and the history of DNA discovery.

Science: The Birchwood Way

Topic: Force, pressure and moments	What can forces do?

Key schema: What is delivered?

-Moment as the turning effect of a force
Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water
-Forces measured in newtons, measurements of stretch or compression as force is changed 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. Balanced forces
-Opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface.

Why is this being taught now?

Pupils will recall prior knowledge on forces from Year 7 and Year 8 looking at the types of forces and the effect they have on varying objects. The idea of pressure has been introduced also in previous years, pupils will retrieve this knowledge and use it to apply the pressure calculation to everyday examples: Sharp knife vs blunt knife, snowshoes vs high heels. Pupils will also discern pressure between gases and liquids (fluids) and look at real world application of hydraulics using repeated practice of the pressure calculation. P= F/A.

Where Programme of study is met.

-Describing motion
-Speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time)
-The representation of a journey on a distance-time graph
-Relative motion: trains and cars passing one another.
-Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)

Building schema- Why is this important?

Forces are a fundamental part of the physics curriculum. As a method for energy transfer pupils can relate the action of forces directly to the changes that occur in the motion of objects. The topic introduces several key equations which will continue to be used into KS4 Working scientifically skills include planning an investigation, presenting data in a variety of formats and plotting line graphs and calculations using equations.

Key concept 3

Balanced and unbalanced forces
Describing speed
Motion graphs
Changing motion
Drag

Topic: Further chemical reactions	What is the reactivity series?

Key schema: What is delivered?

-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
-What catalysts do.

Why is this being taught now?

This unit will build on the chemical reaction work carried out in the Year 8 unit –Chemical Reactions, including work done on the use of word equations, reaction templates and gas tests. They will begin by looking at the reactions of metal carbonates with acids. The test for carbon dioxide will be revisited. The students will then move on to study the reaction of an acid with an alkali. The concept of neutralisation will be introduced and related to the two reactions studied so far in this unit. The following lessons will look at precipitate formation (important for the investigation at the end of this unit) and investigative work. Throughout all these lessons it is vital to stress the importance of making and recording accurate observations and the use of word equations to help describe chemical reactions. A consolidation lesson for the three main gas tests has been included, and it is possible to include a demonstration of the test for chlorine gas in this lesson. The unit will finish with an investigation into the effect concentration has on the rate of a reaction (hydrochloric acid and sodium thiosulfate). The precipitate formed in this lesson links back to lesson 5. It might be possible to introduce the use of some symbol equation work with the most able during this unit to support development into KS4. This should not be the focus of any lesson though and should be limited to the use of pre-given chemical formulae.

Building schema- Why is this important?

Word and symbol equations to demonstrate conservation of matter and mass are key chemistry foci in KS4. Developing and designing investigations and understanding decomposition and neutralisation reactions.

Science: The Birchwood Way

Topic: Plant biology	Do plants reproduce?

Key schema: What is delivered?

-Plant dissection
-Flowering plants
-Seed dispersal
-Fertilisation and germination

Why is this being taught now?

This unit will develop the students understanding of plant biology. They will begin by looking at the basic organisation of flowering plants and the function of each organ(roots, stem, leaf and flower). They will then move onto photosynthesis, looking at the word equation in detail and discussing how the reactants and products enter and leave the plant. The fact that different plants contain different types of chlorophyll will then be investigated, offering the opportunity to revisit skills developed in the Y7 Unit – Separation Techniques. The students will then move onto the organisation of leaves and how this helps maximise photosynthesis. The location of palisade cells and stomata will be discussed and explained. What plants do with the products of photosynthesis will then be covered. The conversion of glucose into starch will be tested for in a leaf and its presence or absence identified and explained. The unit will then move onto the process of sexual reproduction in flowering plants. The organisation and function of a flower will be explained, and the students will have the opportunity to carry out a flower dissection. The processes of fertilisation and pollination will be defined. The process and purpose of seed dispersal will then be explained and linked to competition for resources. Finally, the concept of food security will be introduced. This will be linked to increasing human population size. Factors that can affect food security will be highlighted and solutions to potential problems must be discussed

Where Programme of study is met.

-Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms.
-The dependence of almost all life on Earth on the ability of photosynthetic organisms, 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
-The adaptations of leaves for photosynthesis

Building schema- Why is this important?

This unit provides knowledge on the structure and function of reproduction systems in plants sexual and asexual reproduction and introduces the basic elements of genetics. This build upon reproduction in year 8 and cells in year 7.

Birchwood Community High School

Step- up to GCSE

Topic: Particle model and matter	What is density?

Key schema: What is delivered?

-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
-The properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure
-Changes of state in terms of the particle model.
-Density and equation
-Key practical skills
-Specific heat capacity and equation
-Specific latent heat

Why is this being taught now?

The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft. It also explains why it is difficult to make a good cup of tea high up a mountain.

Building schema- Why is this important?

As students' progress through the curriculum, it is important that they understand how their prior learning provides the foundation for their future success. The knowledge, skills and understanding developed throughout Key Stage 3 are not separate from GCSE; they are the building blocks that students will continue to develop and apply as they move into Key Stage 4.

The **'Step Up to GCSE'** programme marks an important transition for our Year 9 students as they begin to experience the knowledge, language, skills and expectations associated with GCSE study. Rather than viewing GCSE as something that begins in Year 10, students will begin to make meaningful connections between their existing learning and the demands of their future qualifications.

Through a carefully sequenced series of lessons, students will revisit and strengthen key concepts from their prior learning before extending their knowledge and applying it in increasingly challenging contexts. This approach ensures that students recognise the value of what they have already learned, while developing the independence, resilience and confidence needed to become successful KS4 learners.

The programme will provide opportunities for students to **retrieve, connect, deepen and apply** their knowledge, helping them to see how individual topics and skills contribute to a wider understanding of their subject. Students will also begin to develop the study habits and approaches required at GCSE, including working with greater independence, responding to more demanding questions, using subject-specific terminology and explaining their ideas with increasing precision.

By beginning this transition in Year 9, students have the opportunity to build a strong foundation before formally embarking on their GCSE courses. **'Step Up to GCSE' is therefore not simply an introduction to GCSE content; it is a bridge between Key Stage 3 and Key Stage 4**, designed to help students understand where their learning is taking them and prepare them for the challenges and opportunities ahead.

Our aim is for every student to enter KS4 with a secure foundation of prior knowledge, a growing understanding of how their learning connects, and the confidence and skills to become a successful and independent GCSE learner.

Science: The Birchwood Way

Topic: The periodic table	How has the periodic table been developed?

Key schema: What is delivered?

-The development of the periodic table and scientific development including input from Mendeleev and our current periodic table
-Evaluate the current model of an atom
-Subatomic particles and their discovery
-Atomic charges, atomic structure and ions
-Isotopes and their uses
Groups and their physical properties and reactivity
-Application and balancing of symbol equations and conservation of mass.

Why is this being taught now?

The fundamental principal and chemical reactions have been delivered in year 7 and 8 through chemical reactions and further chemical reactions. This topic allows students to understand why those reactions take place. How, without perseverance and development of scientific study we now have a more accurate understanding of the world around us.

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Science: The Birchwood Way

Topic: Cells	What are the differences in eukaryotes and prokaryotes?

Key schema: What is delivered?

-Compare eukaryotic and prokaryotic cells
-Stem cells in plants and animals
Structure and function of subcellular structures
-Standard form and conversion between millimetres, micrometres, nanometres and picometers.
-Specialised cell, differentiation and their functions within plants and animals
-Microscopy and calculations using equations
-Mitosis
-Osmosis, active transport and diffusion

Why is this being taught now?

Cells and cell structures in plants and animals is a key scientific topic in biology and students have been taught about these in both year 7 and year 8.This topic reminds them about their importance and their key features in carrying important processes in both animal and cells and that this fundamental knowledge will be required to access key principals at GCSE.

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