Birchwood Community High School

Year 8 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. *Links to National curriculum coverage

* Links to BEST

Science: The Birchwood Way

Topic: Energy-Thermal transfers	How does thermal energy transfer?

Key schema: What is delivered?

-Conduction
-Convection
-Radiation
-Transfer of energy through particles and vacuum
-Insulators and conductors
-Reducing energy transfer in the home
-Reducing energy transfer in the body

Why is this being taught now?

Delves deeper into energy being transferred using matter, making links between particles and matter in year 7 and waves in year 8.

We are delivering the key concept of energy transfer in the same place as yr7 energy topic, to demonstrate to students that knowledge acquired in year 7 is built upon in subsequent years.

Where Programme of study is met.

National curriculum coverage:

-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
-The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface
-Changes with temperature in motion and spacing of particles
- Internal energy stored in materials

Links to Ks2 National curriculum

Year 4

-Recognise some common conductors and insulators, and associate metals with being good conductors.

Year 5

-Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets

Building schema- Why is this important?

An understanding of Energy, introduced by building on energy topic in Ht1 of year 7. Extends into pathways model allows pupils to describe and explain energy transfers in a wide range of everyday activities. Such as radiant energy. It builds also introduces radiant energy as a wave which sets foundations for energy being transferred as a wave.

Key concept #3

Thermal conduction

Science: The Birchwood Way

Topic: Rocks and weathering	How is our Earth structured?

Key schema: What is delivered?

-Layers of the Earth
-Models of the Earth
-Sedimentary rock
-Igneous rock
-Metamorphic rock
-Carbon cycle

Why is this being taught now?

This topic builds on key stage 2 where pupils learned the planet is dynamic and ever changing. It underpins topics in both Combined GCSE and Triple science. This topic enables students to access explanations for GCSE in parts of B6 evidence for evolution and understand the formation of crude oil in Organic Chemistry. This topic builds on the students' knowledge of the energy and forces topics from year 7. This topic builds on the students' knowledge from the Light & Shadows and Earth & Space topics in the KS2 curriculum.

Where Programme of study is met.

National curriculum coverage:

-The composition of the Earth
-The structure of the Earth
-The 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
-The composition of the atmosphere
-The production of carbon dioxide by human activity and the impact on climate.

Links to Ks2 National curriculum

Year 3

-Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
-Describe in simple terms how fossils are formed when things that have lived are trapped within rock
-Recognise that soils are made from rocks and organic matter.

Building schema- Why is this important?

How layers to our planet are different compositions.

Science: The Birchwood Way

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: Respiration and breathing

How does the breathing systems enable the survival of an organism?

Key schema: What is delivered?

-Structure of the respiratory system
-Comparing inhaled and exhaled air
-Breathing systems in other organisms
-Aerobic, anaerobic and fermentation and the reactants and products involved.

Why is this being taught now?

The aim of this unit is to develop the students understanding of several biochemical processes and the structures that facilitate them. They will begin with the students looking at the different types of respiration (aerobic, anaerobic and fermentation). They will look at the word equations for each type of respiration, the subcellular structures involved and the amount of energy released. The industrial uses of the products from fermentation will be highlighted. They will then move on to study the structure and function of the human respiratory system and the process of breathing (inhalation and exhalation). The way in which other organisms exchange gases will also be studied – limited to bacteria, insects, fish and whales. This can be compared to gas exchange in humans. The impact of smoking and vaping on the body will be studied as will impact of asthma. The students will then take a brief look at the structure of the mammalian circulatory system, including the blood. Finally, the effect of exercise on pulse rate and breathing rate will be investigated with the reasons for any changes being clearly explained and linked to aerobic respiration. This will be linked to recovery time and fitness.

Where Programme of study is met.

-Aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life
-A word summary for aerobic respiration
-The process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration
-The differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism.
-The structure and functions of the gas exchange system in humans, including adaptations to function
-The mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume
-The impact of exercise, asthma and smoking on the human gas exchange system
-The role of leaf stomata in gas exchange in plants

Links to Ks2 National curriculum

Year 6
-Recognise the impact of diet, exercise, drugs and lifestyle on the way their body's function

Building schema- Why is this important?

Students have studied energy in Ht1 of year 7, 8 and 9 and this has prepared them for this key concept of biology- bioenergetics. This topic has many cross-discipline links to biology and chemistry at KS4.

Topic: Moving by force	What is speed?

Key schema: What is delivered?

- Speed, distance time graphs
- Relative motion: trains and cars passing one another.

Why is this being taught now?

In half term two of year 7, students studied forces and resultant forces. This topic allows the building onto prior knowledge in terms of the key concept of forces and studying motion.

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)

Links to Ks2 National curriculum

Year 6
-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.

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 calculating gradients.

Key concept 3
Balanced and unbalanced forces
Describing speed
Motion graphs

Science: The Birchwood Way

Changing motion
Drag

Science: The Birchwood Way

Topic: Chemical reactions	What is the reactivity series?

Key schema: What is delivered?

-Reactivity series
-Displacement reactions
-Uses of carbon to obtain metals
-Thermal decomposition
-Energetics- endothermic and exothermic reactions
-Catalysts

Why is this being taught now?

The students have studies in the same half term about chemical reactions in year 7, this builds upon this knowledge in identifying different chemical reactions and what is happening on an atomic scale.

Where Programme of study is met.

National curriculum coverage:

-The order of metals and carbon in the reactivity series
-The use of carbon in obtaining metals from metal oxides
-Properties of ceramics, polymers and composites (qualitative).

Links to Ks2 National curriculum

-Understanding the world around them.

Building schema- Why is this important?

This unit explains how reactivity of metals is important in extracting materials from the ground. Students will investigate how carbon is used to displacement oxygen from its compounds and build on learning during Yr8 when they studied chemical reactions and neutralisation reactions.

Science: The Birchwood Way

Topic: Reproduction	How do we reproduce?

Key schema: What is delivered?

-The difference between puberty and adolescence
-Changes our bodies undergo between childhood and adulthood
-Male and female reproductive organ systems
-Conception and fertilisation
-Menstrual cycle
-Pregnancy and birth
-Plant dissection
-Flowering plants
-Seed dispersal
-Fertilisation and germination

Why is this being taught now?

This topic builds on the knowledge gained in the cell's unit and at KS2 where students have been introduced to puberty and menstruation through science as well as PHSE. Following this unit, students will be able to build on their knowledge in the ecology unit in both year 8 and year 11 where they will further look at plant reproduction as well as in year 11 where they will study the menstrual cycle and the role of hormones within the cycle.

Where Programme of study is met.

National curriculum coverage:

-Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems
-Menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta
- The importance of plant reproduction through insect pollination in human food security

Links to Ks2 National curriculum

Year 2

-Notice that animals, including humans, have offspring which grow into adults

Year 5

-Describe the life process of reproduction in some plants and animals.

Building schema- Why is this important?

This unit provides knowledge on the structure and function of reproduction systems in plants and animals, sexual and asexual reproduction and introduces the basic elements of genetics. Students will also learn about puberty and menstruation which is important to them in their current stage in life. During this unit students will have the opportunity to develop their working scientifically skills by collecting, displaying and analysing data. Key concept #1

Sexual reproduction in humans

Science: The Birchwood Way

Topic: Magnetism	What is a magnetic field?

Key schema: What is delivered?

-Magnets and magnetic poles
-Plotting compasses
-Earth's magnetic field
-Compass and magnification
-What an electromagnet is
-Investigation electromagnets
-DC motors- how they work (simple)

Why is this being taught now?

This topic builds upon electrical current in Ht5 of year 7 and build on acquired knowledge of electricity and magnetism taught in the unit prior to this. Electricity and how it reaches our homes, how appliances work and how current, magnetism, voltage and resistance interact is a fundamental principle in understanding electricity, power and physics at KS4 and beyond.

Where Programme of study is met.

National curriculum coverage:

-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).

Links to Ks2 National curriculum

Year 3

-Observe how magnets attract or repel each other and attract some materials and not others
-Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials
-Describe magnets as having two poles
-Predict whether two magnets will attract or repel each other, depending on which poles are facing.

Building schema- Why is this important?

This topic builds upon knowledge gained in KS2 regarding magnetism and forces acting at a distance. This topic builds upon the topic of forces in year 7 and non-contact forces. This topic lays the groundwork for the electricity topic studied in KS4 and electromagnetism and static charge in separate science.

Key concept- static charge
Magnetic fields
Electromagnetism

Science: The Birchwood Way

Topic: Solubility and separation techniques	How are substances separated?

Key schema: What is delivered?

-Filtration
-Evaporation
-Chromatography
-Distillation

Why is this being taught now?

This topic builds on the students' knowledge of particles and matter in year 7. It underpins topics that will be taught in Chemistry in ks4 such as fractional distillation, producing a dry substance and Rf values.

Where Programme of study is met.

National curriculum coverage:

-The concept of a pure substance
-Mixtures, including dissolving
-Simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography

Links to Ks2 National curriculum

Year 5

-Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating
-Demonstrate that dissolving, mixing and changes of state are reversible changes

Building schema- Why is this important?

Particles are foundational concept which will provide the basis of many scientific concepts in all areas. This topic build upon particles and matter in HT1 of year 7. It is also a good opportunity to introduce the idea of a model to explain observations and how separation of particles can be used in industry. The rest of the unit allows students to apply the model to a range of situations and demonstrate its effectiveness at explaining macro and microscopic properties of matter. Distillation, chromatography and separating rock salt develops working scientifically skills.

Key concept # 3 Separating solutions

Science: The Birchwood Way

Topic: Electricity, voltage and resistance	What is the relationship between voltage and resistance?

Key schema: What is delivered?

- What is potential difference?
- What is voltage
- Voltage in series and parallel
- Ratio of P.D to current
- Introduction of equations such as V=IR
- Resistance in conductors and insulators

Why is this being taught now?

This topic builds upon knowledge gained in KS2 regarding electrical appliances and building simple circuits. This topic builds upon the topic 7 -energy and current in year 7 and series and parallel circuits in year 7. This topic lays the groundwork for the electricity topic studied in KS4

Where Programme of study is met.

National curriculum coverage:

-Measured in Volts, in circuits, series and parallel circuits
-Voltage divides where branches occur.
-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 (quantitative).

Links to Ks2 National curriculum

Year 4

-Identify common appliances that run on electricity
-Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
-Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
-Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit -recognise some common conductors and insulators, and associate metals with being good conductors.

Building schema- Why is this important?

This will support students to develop their understanding of what electricity is and what happens within a circuit. Understand the scientific concepts of what happens with in circuits and how component affect the circuit. Students will have an opportunity to investigate further their learning by having an opportunity to carry out various practical's, which will also build on their skills in building circuits. This building on from yr7 electricity and current and students should grasp the deeper level of learning of this key principle.

Key concept # 3 Voltage
Key concept #1 Resistance

Science: The Birchwood Way

Topic: Light	What is a light wave?

Key schema: What is delivered?

-Reflection
-Refraction
-Dispersion
-Absorption
-How we see colour

Why is this being taught now?

Student have studied sound waves in Ht6 of year 7 and energy pathways in year 7.
Light being taught now enables students to understand how light is needed in photosynthesis and how it links in with energy transfer- radiation. It will provide a deeper understanding of the EM spectrum in KS4 physics and how the eye work in triple biology.

Where Programme of study is met.

National curriculum coverage:

-The similarities and differences between light waves and waves in matter
-Light waves travelling through a vacuum; speed of light
-The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface Science – key stage 3
-Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye

Links to Ks2 National curriculum

Year 3

-Recognise that they need light in order to see things and that dark is the absence of light
-Notice that light is reflected from surfaces
-Recognise that light from the sun can be dangerous and that there are ways to protect their eyes
-Recognise that shadows are formed when the light from a light source is blocked by an opaque object
-Find patterns in the way that the size of shadows change.

Building schema- Why is this important?

An understanding of light and its behaviour is linked to a wide range of other topics within the science curriculum in all key stages. As a pathway for energy transfer it is relevant in biology and chemistry. Reflection & Refraction practical's develop scientific working skills.

Science: The Birchwood Way

This topic enables students to access the Plants & Photosynthesis topic in year 9, Energy in year 10, Waves in year 11 and Space Physics in year 11 if Triple Science is taken. Reflection & Refraction practicals develop how to follow a scientific method. Introduces key skills of drawing light ray diagrams and making accurate measurements using a protractor.

Transmission of light
Passive eye
How we see
Ray model
Refraction and lenses
Refraction and dispersion

Birchwood Community High School

Step up programme

Step up to year 9
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 year 7 and 8 are not separate from year 9; they are the building blocks that students will continue to develop and apply as they move into year 9 and then subsequent examinations. **The 'Step Up to Year 9' programme marks an important transition for our Year 8 students as they begin to experience the knowledge, language, skills and expectations associated with a deeper level of understanding of key scientific concepts. Rather than viewing year 7 and 8 as singular learning, students will begin to make meaningful connections between their existing learning and the demands of their future learning.** **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 scientific learners.**