

Science Curriculum– 5 year plan details

Scientific processes 1 - Yr. 7 AUTUMN

Identifying variables

Designing an investigation – bouncing ball

Hazards, risks and equipment

Repeatable results

Interpreting data

Plotting graphs

Processing data

Conclusions and evaluations

Significant figures

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.5 Matter 1 – Yr. 7 AUTUMN

1.5.1 Using particles to explain matter

1.5.2 Understanding solids

1.5.3 Understanding liquids and gases

1.5.4 Exploring diffusion

1.5.5 Explaining changes of state

1.5.6 Separating mixtures

1.5.7 Exploring solutions

1.5.8 Understanding distillation

1.5.9 Exploring chromatography

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.8 Organisms/ Organisation 1 – Yr. 7 AUTUMN

1.8.1 Exploring the human skeleton

1.8.2 Understanding the role of joints and muscles

1.8.3 Examining interacting muscles

1.8.4 Exploring problems with the skeletal system

1.8.5 Understanding organisation in organisms

1.8.6 Describing animal and plant cells

1.8.7 Understanding adaptations of cells

1.8.8 Exploring cells

1.8.9 Understanding unicellular organisms

Extended writing: Comparing different types of cells

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework: Making a model of a cell of their choice

Scientific processes 2 - Yr 7 SPRING

Scientific theories

Planning

Risk – testing a leaf for starch

Reproducible results – comparing data

Presenting data

Describing trends

Evaluating methods and data

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.1 Forces 1 - Yr 7 SPRING

- 1.1.1 Understanding speed
- 1.1.2 Describing journeys with distance-time graphs
- 1.1.3 Exploring journeys on distance-time graphs
- 1.1.4 Investigating the motion of a car on a ramp
- 1.1.5 Understanding relative motion
- 1.1.6 Understanding forces
- 1.1.7 Understanding gravitational fields
- 1.1.8 Understanding mass and weight
- 1.1.9 Understanding gravity

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.10 Genes 1 – Yr 7 - SPRING

- 1.10.1 Looking at variation
- 1.10.2 Exploring causes of variation
- 1.10.3 Considering the importance of variation
- 1.10.4 Understanding the female reproductive system and fertility
- 1.10.5 Understanding the male reproductive system and fertilisation
- 1.10.6 Learning how a foetus develops
- 1.10.7 Understanding factors affecting a developing foetus
- 1.10.8 Communicating ideas about smoking in pregnancy

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.3 Energy - Yr 7 SUMMER

- 1.3.1 Understanding energy transfer by fuels and food
- 1.3.2 Comparing rates of energy transfers
- 1.3.3 Looking at the cost of energy use in the home
- 1.3.4 Getting the electricity we need
- 1.3.5 Using electricity responsibly
- 1.3.6 Energy stores and transfers
- 1.3.7 Exploring energy transfers
- 1.3.8 Understanding potential energy and kinetic energy
- 1.3.9 Understanding elastic energy

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.6 Reactions 1 - Yr 7 SUMMER

- 1.6.1 Using metals and non-metals
- 1.6.2 Exploring the reactions of metals with acids
- 1.6.3 Understanding displacement reactions
- 1.6.4 Understanding oxidation reactions
- 1.6.5 Exploring acids
- 1.6.6 Exploring alkalis
- 1.6.7 Using indicators
- 1.6.8 Exploring neutralisation
- 1.6.9 Investigating neutralisation

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.9 Ecosystem – Yr 7 SUMMER

- 1.9.1 Understanding food webs
- 1.9.2 Understanding the effects of toxins in the environment
- 1.9.3 Exploring the importance of insects
- 1.9.4 Exploring ecological balance
- 1.9.5 Exploring flowering plants
- 1.9.6 Exploring fertilisation
- 1.9.7 Understanding how seeds are dispersed
- 1.9.8 Understanding how fruits disperse seeds

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.1 Forces - Yr 8 AUTUMN

- 2.1.1 Analysing equilibrium
- 2.1.2 What a drag!
- 2.1.3 Understanding stretch and compression
- 2.1.4 Investigating Hooke's Law
- 2.1.5 Exploring pressure on a solid surface
- 2.1.6 Exploring pressure in a fluid
- 2.1.7 Calculating pressure
- 2.1.8 Explaining sinking and floating

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

Scientific Processes 3 - Yr 8 AUTUMN

Planning experimental methods – indigestion remedy

Selecting apparatus, recording results, reaction of metals

Using models – word equations

Selecting apparatus, recording results, thermal decomposition

Carry out an experiment safely, collect results accurately and perform calculations

Chemical formulae

Carry out a complete Investigation into energy transfer, evaluate risks, obtain, analyse and evaluate results

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.8 Organisms/ Organisation - Yr 8 AUTUMN (Contingency AUTUMN Yr 9)

- 2.8.1 Understanding how we breathe
- 2.8.2 Measuring breathing
- 2.8.3 Explaining gas exchange in humans
- 2.8.4 Exploring the effects of disease and lifestyle
- 2.8.5 Exploring a healthy diet
- 2.8.6 Understanding the effects of an unbalanced diet
- 2.8.7 Understanding the human digestive system
- 2.8.8 Understanding the roles of the digestive organs

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.5 Matter 2 - Yr 8 SPRING (contingency AUTUMN yr 9)

- 2.5.1 Looking at the periodic table of elements
- 2.5.2 Exploring metals in the periodic table
- 2.5.3 Exploring non-metals in the periodic table
- 2.5.4 Analysing wider patterns within the periodic table
- 2.5.5 Combining elements
- 2.5.6 Comparing elements and compounds
- 2.5.7 Exploring polymers
- 2.5.8 Exploring ceramics and composites

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.6 Reactions 2 - Yr 8 SPRING

- 2.6.1 Understanding exothermic reactions
- 2.6.2 Comparing endothermic and exothermic changes
- 2.6.3 Investigating endothermic reactions
- 2.6.4 Explaining the use of catalysts
- 2.6.5 Exploring combustion
- 2.6.6 Exploring the use of fuels
- 2.6.7 Understanding thermal decomposition
- 2.6.8 Explaining changes

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.4 Waves 2 – Yr 8 SPRING (contingency – SPRING Yr9)

- 2.4.1 Exploring sound
- 2.4.2 Sound systems
- 2.4.3 Exploring light
- 2.4.4 Comparing transverse and longitudinal waves
- 2.4.5 Exploring waves

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.2 Electromagnets 2 - Yr 8 SUMMER

- 2.2.1 Forces and fields
- 2.2.2 Using ideas about fields
- 2.2.3 Investigating electromagnetism
- 2.2.4 Using electromagnets
- 2.2.5 Investigating strength of electromagnets

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.9 Ecosystems - Yr 8 SUMMER (contingency -SUMMER Yr 9)

- 2.9.1 Understanding aerobic respiration
- 2.9.2 Exploring respiration in sport
- 2.9.3 Understanding anaerobic respiration
- 2.9.4 Investigating fermentation
- 2.9.5 Comparing aerobic and anaerobic respiration
- 2.9.6 Exploring how plants make food
- 2.9.7 Looking at leaves
- 2.9.8 Exploring the movement of water and minerals in plants
- 2.9.9 Investigating the importance of minerals to plants
- 2.9.10 Investigating photosynthesis

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.10 Genes 2 – Yr 8 SUMMER

- 2.10.1 Explaining natural selection
- 2.10.2 Understanding the importance of biodiversity
- 2.10.3 Explaining extinction
- 2.10.4 Understanding the nature of genetic material
- 2.10.5 Exploring the role of chromosomes
- 2.10.6 Understanding variation
- 2.10.7 Modelling inheritance

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.3 Energy - Yr 9 Physics NC AUTUMN

- 2.3.1 Doing work
- 2.3.2 Making work easier
- 2.3.3 Explaining thermal energy
- 2.3.4 Heating
- 2.3.5 How to stop energy from travelling
- 2.3.6 Energy and temperature
- ^Energy stores in systems
- ^Changes in energy stores
- ^Calculating changes in energy
- ^Calculating changes in thermal energy stores
- ^Relating power and energy transfers
- ^Describing how energy is dissipated
- ^calculating efficiency of energy transfers
- ^Comparing energy resources and their uses

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.4 Waves - Yr 9 Physics SPRING

- 1.4.1 Exploring sound
- 1.4.2 Describing sound
- 1.4.3 Hearing sounds
- 1.4.4 Understanding how sound travels through materials
- 1.4.5 Learning about the reflection and absorption of sound
- 1.4.6 Exploring properties of light
- 1.4.7 Exploring reflection
- 1.4.8 Exploring refraction
- 1.4.9 Seeing clearly
- 1.4.10 Exploring coloured light

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.7 Space – Yr 9 Physics NC SPRING

- 1.7.6 Describing stars and galaxies
- 1.7.7 Explaining the effects of the Earth's motion
- 1.7.8 Exploring our neighbours in the Universe
- 1.7.9 Using models in science
- ^life cycle of a star
- ^Evidence for the big bang theory

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

1.2 Electricity - Yr 9 Physics SUMMER

- 1.2.1 Describing electric circuits
- 1.2.2 Understanding energy in circuits
- 1.2.3 Explaining resistance
- 1.2.4 Describing series and parallel circuits
- 1.2.5 Comparing series and parallel circuits
- 1.2.6 Investigating static charge
- 1.2.7 Explaining static charge
- 1.2.8 Understanding electric fields

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

Atomic structure and periodic table – Yr 9 Chemistry AUTUMN (extension of 2.5)

2.5.0 Review of 2.5 Matter 2 from year 8

- ^Compare elements, compounds and mixtures
- ^Describe the structure of an atom
- ^Understand how to determine the structure of the atom from periodic table notation, period and group
 - Electronic configuration
- ^Understand how models of the atom were developed
- ^Understand how the periodic table was developed
- ^Explain the properties of group 1,7,0 and the transition metals
- ^Understand when to use different separation techniques

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

Structure and Bonding – Yr 9 Chemistry SPRING (extension of 2.5)

- ^Understanding what ions are
- ^Describing ionic bonds
- ^Describing different types of bonds
- ^Describing covalent bonds
- ^Describing metallic bonds
- ^Understanding what happens during change of state

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.7 Earth – Yr 9 Chemistry SUMMER

- 2.7.1 Understanding our atmosphere
- 2.7.2 Understanding how carbon is recycled
- 2.7.3 Exploring how humans affect the carbon cycle
- 2.7.4 Understanding global warming
- 2.7.5 Exploring damage to the Earth's resources
- 2.7.6 Considering the importance of recycling
- 2.7.7 How to extract metals

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

Chemical Changes – Yr 9 Chemistry SUMMER (extension of 1.6)

- ^Describing reactions of metal oxides
- ^Understanding the reactivity series
- ^Understanding how metals are extracted (extension of 2.7.7)
- ^Describing how salts are produced from metals
- ^Explaining neutralization reactions
- ^Comparing weak and strong acids
- ^Describing electrolysis

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

Cell Biology – Yr 9 Biology AUTUMN (review and extension of 1.8)

- ^Comparing animal and plant cells
- ^Explaining cell specialisation
- ^Understanding the role of stem Cells
- ^Comparing prokaryotic and eukaryotic cells
- ^Comparing light and electron microscopy
- ^Describing cell division
- ^Describing and comparing transport in cells

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

Organisation – Yr 9 Biology SPRING (review and extension of 2.8)

2.8.0 Review of 2.8 Organisms from year 8

- ^The structure and functions of the digestive system.
- ^Understanding the role of enzymes
- ^Investigate the effect of pH on the rate of reaction of amylase enzyme.
- ^Human digestive enzymes
- ^Describing how to test for food groups
- ^Understanding the role of the cardiovascular system
- ^Understanding the role of the respiratory system
- ^Understanding problems with the heart
- ^Evaluating treatment of heart conditions

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

Infection and response – Yr 9 Biology SUMMER (extension of 1.8 and 2.8)

- ^Understanding how diseases are spread
- ^Describing different types of diseases
- ^Understanding human defense systems
- ^Describing how vaccines work
- ^Understanding the role of antibiotics
- ^Understanding how pain killers work
- ^Understanding how drugs are developed and the drug testing process

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

2.9 Ecosystems (contingency - SUMMER Yr 9)

- 2.9.1 Understanding aerobic respiration
- 2.9.2 Exploring respiration in sport
- 2.9.3 Understanding anaerobic respiration
- 2.9.4 Investigating fermentation
- 2.9.5 Comparing aerobic and anaerobic respiration
- 2.9.6 Exploring how plants make food
- 2.9.7 Looking at leaves
- 2.9.8 Exploring the movement of water and minerals in plants
- 2.9.9 Investigating the importance of minerals to plants
- 2.9.10 Investigating photosynthesis

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

[National Curriculum for Earth Science covered in Geography KS3

- 1.7.1 Understanding the structure of the Earth
- 1.7.2 Exploring igneous rocks
- 1.7.3 Exploring sedimentary rocks
- 1.7.4 Exploring metamorphic rocks
- 1.7.5 Understanding the rock cycle]

KS4 Biology – Bioenergetics – Yr 10

In this section we will explore how plants harness the Sun's energy in photosynthesis in order to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere.

Both animals and plants use this oxygen to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions.

Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Biology – Homeostasis and response – Yr 10

Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes.

We will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Biology – Inheritance, variation and evolution – Yr 10

In this section we will discover how the number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the individual. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve.

An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic.

Scientists have now discovered how to take genes from one species and introduce them in to the genome of another by a process called genetic engineering. In spite of the huge potential benefits that this technology can offer, genetic modification still remains highly controversial.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Biology – Ecology – Yr 11

The Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis.

All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development.

In order to continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity and well-being.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Biology – Cell Biology – Yr 11

Cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells.

If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Biology – Organisation – Yr 11

In this section we will learn about the human digestive system which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Biology – Infection and response – Yr 11

Pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill.

We will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease.

When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. Since the 1940s a range of antibiotics have been developed which have proved successful against a number of lethal diseases caused by bacteria. Unfortunately many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry – Quantitative Chemistry 1 Yr 10

Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions. Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a key way for chemists to communicate chemical ideas.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry – Rate and extent of chemical change Yr 10

Chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in order to speed them up or slow them down. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established in order to identify how to maximise the yield of desired product. Understanding energy changes that accompany chemical reactions is important for this process. In industry, chemists and chemical engineers determine the effect of different variables on reaction rate and yield of product. Whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry - Chemical analysis

Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organising their results logically. Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms. The extraction of important resources from the Earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry – Chemical changes Yr 10

Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organising their results logically. Knowing about these different chemical

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and use this knowledge to develop a wide range of different materials and processes. It also helped

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The extraction of important resources from the Earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry –Energy Changes Yr 10

Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry – Chemistry of the atmosphere – Yr 10

The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions that help to reduce the impact of human activity.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry – Using resources Yr 11

Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry – Quantitative chemistry 2 – Year 11

Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions. Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a key way for chemists to communicate chemical ideas. More complex quantitative analysis will be addressed at this revisit of the topic.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural: Homework:

KS4 Chemistry – Organic chemistry Yr 11

The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists are able to take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry – Atomic Structure and periodic table Yr 11 review

The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. The arrangement of elements in the modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Chemistry – Structure and bonding chemistry Yr 11 Review

Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Physics – Electricity (extension of electricity covered in year 9) – **Yr 10**

Electric charge is a fundamental property of matter everywhere. Understanding the difference in the microstructure of conductors, semiconductors and insulators makes it possible to design components and build electric circuits. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. Electrical power fills the modern world with artificial light and sound, information and entertainment, remote sensing and control. The fundamentals of electromagnetism were worked out by scientists of the 19th century. However, power stations, like all machines, have a limited lifetime. If we all continue to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future?

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Physics – Waves(extension of waves covered in year 9) – **Yr 11**

Wave behaviour is common in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Physics – Forces – Yr 10

Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Physics – Particle model of the atom – Yr 10

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!

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Physics – Atomic structure – Yr 10

Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. Early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently improved. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Physics – Magnetism and Electromagnetism – Yr 11

Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Physics – Space – Yr 11

Questions about where we are, and where we came from, have been asked for thousands of years. In the past century, astronomers and astrophysicists have made remarkable progress in understanding the scale and structure of the universe, its evolution and ours. New questions have emerged recently. 'Dark matter', which bends light and holds galaxies together but does not emit electromagnetic radiation, is everywhere – what is it? And what is causing the universe to expand ever faster?

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework:

KS4 Physics – Energy across all topics (extension of energy covered in year 9)– Yr 11

The concept of energy emerged in the 19th century. The idea was used to explain the work output of steam engines and then generalised to understand other heat engines. It also became a key tool for understanding chemical reactions and biological systems. Limits to the use of fossil fuels and global warming are critical problems for this century. Physicists and engineers are working hard to identify ways to reduce our energy usage.

Extended writing:

Literacy:

Numeracy:

Soft skills:

Cultural:

Homework: