# Subject Curriculum Information Pack

Pedmore
High School

*Aspire, Persevere, Succeed*

# Curriculum Intent

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# Curriculum statement:

## Science

**Intent**

KS3– Our curriculum is a broad and balanced curriculum that promotes the joy of science amongst our young people through linked and discrete topics. It is a spiral curriculum that has been designed to ensure that content is sequential and develops in difficulty as a child moves through the school, with simpler content taught earlier and more difficult content taught later on. The curriculum builds up knowledge ready for Key Stage 4.

KS4– Our curriculum continues to spiral from key stage 3, revisiting and developing prior knowledge and understanding. It also builds upon the KS3 Curriculum intent with a joy of science key amongst our pupils. Pupils develop skills to question and critique and develop problem solving skills. Our pupils will learn how to use scientific language to articulate their thinking and engage with the wider world through a rounded knowledge of science. Tasks across both key stages enhance literacy and numeracy with these skills taught explicitly in relevant lessons. How science works skill are developed with multiple and repeated practice of the key skills across all key stages.

We value resilience and logical thinking. We expect our students to question their understanding of science and reflect upon real world situations.

# Year 10 Curriculum Assessment Map

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# Curriculum Assessment Map: Year 10 Physics.

**This course runs alongside Biology and Chemistry. The Physics components have been highlighted on this document in bold.**

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| | Autumn Term | Spring Term | Summer Term |
|---|---|---|---|
| **Topic** | Inheritance, Variation and Evolution<br>Bonding Structure and Properties of Matter<br>**Atomic Structure**<br>Homeostasis | Chemical Changes<br>Quantitative Chemistry<br>**Forces**<br>Using Resources | Waves<br>Revision for Mocks |
| **Key Learning** | ***Inheritance, Variation and Evolution***<br>Understand how the number of chromosomes are halved during meiosis and then combined with new genes during fertilisation to produce unique offspring. Gene mutations occur continuously and occasionally 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. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve.<br>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.<br>***Bonding, Structure and Properties of Matter***<br>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.<br>***Atomic Structure***<br>**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**<br>**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.**<br>*Homeostasis*<br>Cells in the body 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. Understand the structure and function of the nervous system and how it can bring about fast responses. Also 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. | ***Chemical Changes and Quantitative Chemistry***<br>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 develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms. 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.<br>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.<br>***Forces***<br>**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.**<br>***Using Resources***<br>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. Environmental chemists study how human activity has affected the Earth's natural cycles, and how to minimise damaging effects. | ***Waves***<br>**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.** |
| **Skills across the year** | ***Analyse***<br>Analyse Patterns<br>Discuss Limitations<br>Draw Conclusions<br>Present data | ***Communicate***<br>Communicate ideas<br>Construct explanations<br>Critique claims<br>Justify Opinions | ***Enquire***<br>Collect data<br>Devise questions<br>Plan variables<br>Test hypotheses | ***Solve***<br>Estimate risks<br>Examine consequences<br>Review theories<br>Interrogate sources |

# Curriculum Assessment Map: Year 10 Physics.

**This course runs alongside Biology and Chemistry. The Physics components have been highlighted on this document in bold.**

| | | | |
|---|---|---|---|
| **End points** | • Order DNA, chromosome, double helix, nucleus and cell by size<br>• Name the male and female gametes in animals<br>• State the type of cell division that makes gametes in humans<br>• Know a gene is a short section of DNA that codes for a characteristic<br>• Define alleles, genotype, phenotype, heterozygous and homozygous<br>• Use punnet squares to determine that probability of sex, some characteristics and inherited diseases<br>• Recognise genotypes as heterozygous or homozygous<br>• Give arguments for and against screening embryos<br>• Describe how evolution leads to variation and antibiotic resistant bacteria<br>• Know the stages of selective breeding and genetic engineering<br>• State how fossils are formed and can be used to support the theory of evolution<br>• Classify organisms using the Linnaean system<br>• Describe how the formation of ions leads to ionic bonding and ionic compounds<br>• Describe using dot and cross diagrams how covalent bonds form<br>• Use the atomic model to describe metallic bonding<br>• State the properties of covalent, metallic and ionic substances<br>• Explain the differences in properties of simple molecular and giant covalent compounds<br>• Describe the bonding in polymers and how this causes properties<br>• Identify states of matter in symbol equations<br>• **Draw and label an atom**<br>• **Define the terms isotope, mass number, atomic number, ion and half-life**<br>• **Know the properties of the three types of ionising radiation**<br>• **Interpret half-life graphs**<br>• **Give example of how to prevent contamination and irradiation**<br>• **Compare the hazards of the three types of ionising radiation**<br>• Define homeostasis<br>• Identify key parts of the nervous system<br>• Describe the purpose of a reflex action<br>• Identify factors that affect reaction time<br>• Give similarities and difference between nervous and hormonal responses<br>• Describe the role of hormones in controlling blood glucose concentration and the menstrual cycle<br>• State the roles of different contraceptives | • Calculate relative formula mass<br>• Use the law of conservation of mass<br>• Use the concentration equation<br>• Define acid, alkali and neutral<br>• Write word equation for reactions between an acid and a base, a metal and an acid, metals and oxygen and metals and water.<br>• State what the reactivity series tells us about the reactivity of metals<br>• State how different metals can be extracted<br>• Define electrolyte, anode, cathode, cation and anion<br>• Predict the products of electrolysis<br>• **Explain the differences between scalar and vector quantities**<br>• **Explain the differences between contact and non-contact forces**<br>• **Use the weight equation**<br>• **Calculate resultant forces**<br>• **Use the work done equation**<br>• **Describe a method for investigating the relationship between force and extension**<br>• **Use the equation for spring constant**<br>• **Explain the differences between displacement and distance**<br>• **Estimate the speed of a person walking, running and cycling**<br>• **Use the equations of acceleration**<br>• **Interpret distance-time and velocity-time graphs**<br>• **State Newton's three laws of motion**<br>• **Describe an experiment to investigate Newton's second law**<br>• **State factors that effect a person's reaction time**<br>• **Calculate stopping distance**<br>• **Identify factors that effect stopping distance**<br>• **Describe an experiment to compare human reaction time**<br>• Give examples of different types of materials<br>• Create a life cycle assessment for a product<br>• State sustainable methods of product disposal<br>• Define potable water<br>• Describe processes to purify water<br>• Describe the processes of treating waste water | • **Order the electromagnetic spectrum by wavelength**<br>• **State the uses and dangers of electromagnetic waves**<br>• **Describe an experiment to measure the infrared emission and absorption of different surfaces**<br>• Revise key topics from Biology Paper 1<br>• Revise key topics from Chemistry Paper 1 |
| **Informal (formative) Assessment** | GRIT and Live Marking<br>DIRT for mock exams<br>Think Pink sheets | GRIT and Live Marking<br>DIRT for mock exams<br>Think Pink sheets | GRIT and Live Marking<br>DIRT for mock exams<br>Think Pink sheets |
| **Formal (summative) Assessment** | Two 45 minute tests on:<br>Inheritance, Variation and Evolution<br>Bonding Structure and Properties of Matter<br>**Atomic Structure**<br>Homeostasis | Two 45 minute tests on:<br>Chemical Changes<br>Quantitative Chemistry<br>Forces | Two 45 minute tests on:<br>Using Resources<br>Waves Part 2<br><br>Mock Exams |

# Year 11 Curriculum Assessment Map

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# Curriculum Assessment Map: Year 11 Physics.

**This course runs alongside Biology and Chemistry. The Physics components have been highlighted on this document in bold.**

| | Autumn Term | Spring Term | Summer Term |
|---|---|---|---|
| **Topic** | Ecology<br>**Electromagnetism**<br>Organic Chemistry<br>Chemical Analysis<br>Space (triple only) | Cell Biology<br>Organisation<br>Infection and Response<br>Chemistry of the atmosphere<br>**Electricity** | Revision for Summer 2023 GCSE exams |
| **Key Learning** | E***cology***<br>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.<br>***Electromagnetism***<br>**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.**<br>***Organic Chemistry***<br>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.<br>***Chemical Analysis***<br>Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are<br>particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work.<br>***Space (Triple Only)***<br>**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?** | ***Cell Biology***<br>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<br>***Organisation***<br>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.<br>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<br>***Infection and Response***<br>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.<br>***Chemistry of the Atmosphere***<br>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. 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.<br>***Electricity***<br>**Electric charge is a fundamental property of matter. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. The fundamentals of electromagnetism were worked out by scientists of the 19th century. Power stations have a limited lifetime. If we all continue** | |

# Curriculum Assessment Map: Year 11 Physics.

**This course runs alongside Biology and Chemistry. The Physics components have been highlighted on this document in bold.**

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| | | | **to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future?** | |
| **Skills across the year** | ***Analyse***<br>Analyse Patterns<br>Discuss Limitations<br>Draw Conclusions<br>Present data | ***Communicate***<br>Communicate ideas<br>Construct explanations<br>Critique claims<br>Justify Opinions | ***Enquire***<br>Collect data<br>Devise questions<br>Plan variables<br>Test hypotheses | ***Solve***<br>Estimate risks<br>Examine consequences<br>Review theories<br>Interrogate sources |
| **End points** | • Identify what animals and plants compete for<br>• Define habitat, environment, ecosystem, abiotic, biotic, adaptation and community<br>• Identify abiotic and biotic factors<br>• State adaptations and describe their usefulness<br>• Draw food chains and webs<br>• Identify feeding relationships<br>• Explain how factors can affect population sizes<br>• Explain how quadrats can be used to investigate the distribution of plants in two areas<br>• Suggest why a transect might be used<br>• Describe the main stages of the water and carbon cycle<br>• Describe human impacts on the planet<br>• Explain how sustainability can protect ecosystems<br>• **Draw magnetic field lines around a magnet**<br>• **State the forces between poles of a magnet**<br>• **Describe the behaviour of a compass**<br>• **Explain how to use the right-hand thumb rule**<br>• **Define a solenoid and draw its magnetic field lines**<br>• **State how to increase the strength of a solenoid's magnetic field**<br>• State the composition of hydrocarbons<br>• State the general formulas of hydrocarbons<br>• Draw the structure of common hydrocarbons<br>• Compare complete and incomplete combustion of hydrocarbons<br>• Give the products that can be made from crude oil<br>• Describe the process of fractional distillation and its uses<br>• State the conditions of cracking and why it is needed<br>• State the test for alkenes<br>• Define a pure substance and formulation<br>• Describe how the boiling point can be used to test the purity of a substance<br>• Describe the process of chromatography in separating soluble substances<br>• Interpret chromatograms<br>• Give the formula for working out Rf values<br>• Identify a positive test for different gases | | • Identify cells and the use of microscopy<br>• Understand cells differentiate and divide<br>• State the uses of stem cells<br>• Describe the exchanging of substances<br>• Define the terms cell, tissue, organ, organ system and organism<br>• Describe common food tests<br>• Explain the role of enzymes in the digestive system<br>• Identify the role of the lungs and heart in the respiratory system and circulatory system<br>• State common non-communicable diseases and risk factors<br>• Describe how plants are organised<br>• Name the four types of pathogen<br>• Identify common communicable diseases<br>• Identify how the body prevents and fights diseases<br>• Describe preclinical drugs testing<br>• State the stages of the evolution of the atmosphere<br>• Identify the greenhouse gases<br>• Describe the effects of climate change<br>• Describe the greenhouse effect<br>• Identify common atmospheric pollutants and their effects<br>• **Draw simple circuit diagrams and recognise common components**<br>• **Describe how you would investigate how the length of the wire affects resistance**<br>• **Interpret I-V graphs**<br>• **Use equations to calculate current, potential difference, power, charge and resistance**<br>• **Know the properties of series and parallel circuits**<br>• **Know the potential difference and frequency of UK mains supply**<br>• **Know the colours of each wire in a UK plug**<br>• **Explain how transformers are used in the national grid** | • Revise key Science topics for summer exams |

# Curriculum Assessment Map: Year 11 Physics.

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| | **Triple Only:**<br>• **Define key cosmological bodies**<br>• **State the stages of the life cycle of a star**<br>• **Describe the orbits of the planets in our Solar System**<br>• **Describe the Big Bang theory and explain evidence for it** | | |
| **Informal (formative) Assessment** | GRIT and Live Marking<br>DIRT for mock exams<br>Think Pink sheets | GRIT and Live Marking<br>DIRT for mock exams<br>Think Pink sheets | GRIT and Live Marking<br>DIRT for mock exams<br>Think Pink sheets |
| **Formal (summative) Assessment** | Two 45 minute tests on:<br>Ecology<br>**Electromagnetism**<br>Organic Chemistry<br>Chemical Analysis<br>**Space (triple only)** | Mocks | Exams |

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