

**SCIENCE CURRICULUM MAP – 2022-2023**

TERM	BTEC First – Principles of Applied Science – Year 1 Year 2 – Biology and the Environment / Exam Preparation	WJEC – Entry Level Science (EL1-EL3)
Autumn 1	<p><b>Pearson Edexcel – Unit 3 - Energy and Our Universe</b></p> <p>Students will learn about</p> <p>A.1 The structure of nuclei using the terms ‘atomic (proton) number’ and ‘mass (nucleon) number’, and using symbols in the format:</p> <p>A.2 Alpha, beta and gamma radiations are emitted from unstable nuclei in a random process.</p> <p>A.3 An alpha particle is equivalent to a helium nucleus, a beta particle is an electron emitted from the nucleus and gamma rays are high-frequency electromagnetic waves.</p> <p>A.4 Ionising radiations cause atoms to gain or lose electrons to form ions.</p> <p>A.5 Alpha, beta and gamma radiations are compared in terms of their abilities to penetrate and ionise.</p> <p>A.6 Effects of different radiations on living cells.</p> <p>A.7 Uses of ionising radiations, including alpha, beta, gamma and X-rays.</p> <p>A.8 Investigate radioactive decay in terms of reducing activity and amount of radioactive material.</p> <p>A.9 Investigate half-life of radioactive isotopes in terms of reducing activity.</p> <p>A.10 Calculations involving half-life and their graphical representations.</p> <p>A.11 Nuclear fission is large nuclei breaking down to form small nuclei.</p> <p>A.12 Nuclear fusion is the creation of larger nuclei from smaller nuclei.</p> <p>A.13 Energy release by the process of controlled nuclear fission.</p> <p>A.14 Energy release by nuclear fusion in stars and the difficulty in harnessing energy from nuclear fusion on Earth.</p> <p>A.15 Environmental issues associated with nuclear energy (storage of waste products, uncontrolled release of radioactive material)</p> <p><b>KEY WORDS:</b></p> <ul style="list-style-type: none"> <li>-atomic nuclei</li> <li>-radiation</li> <li>-isotopes</li> <li>-nuclear</li> <li>-radioactive decay</li> <li>-environment</li> <li>-fission</li> <li>-fusion</li> </ul>	<p><b>Physics – Forces and Motion</b></p> <p>Physics is the foundational Science in terms of understanding scientific ways of thinking, and developing analytical skills.</p> <p>Students will study forces and motion, developing Maths skills alongside their scientific vocabulary.</p> <p>Students will study Motion in full through an interrogation into speed, distance and time. Students will undertake a lot of practicals for this subject, such as walking, running and cycling and timing themselves over a set distance. Students will study more abstract concepts such as the speed of sound through the use of videos and real-life applications (fighter jets taking off etc.)</p> <p>Students will learn through the use of literacy starters, teaching from first principles (“what is motion?”), and mastering these first principles before applying it further. I.e. to understand speed=distance/time they have to first understand that speed is a measurement of motion.</p> <p><b>KEY WORDS</b></p> <ul style="list-style-type: none"> <li>-Motion</li> <li>-Forces</li> <li>-Speed</li> <li>-Acceleration</li> <li>-Newtons</li> </ul> <p><b>Literacy Element:</b></p> <p>The development of their use of scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy Starters and finish with the production of display posters that demonstrate their understanding of the taught scientific concepts.</p>



	<p><b>Literacy Element:</b>          The development of their use of scientific vocabulary and nomenclature is paramount to the teaching of Science at the Courtyard. This will start with Literacy starters and finish with the production of display posters that demonstrate their understanding of the scientific concepts learned about.</p> <p><b>Formal Assessment</b>          Course work – completing the relevant Assignment Briefs for Unit 3.</p>	
<p><b>Autumn 2</b></p>	<p><b>Pearson Edexcel – Unit 3 – Energy and our Universe</b></p> <p>Students will learn about</p> <p>B.1 Electric circuits:</p> <ul style="list-style-type: none"> <li>• the need for a complete circuit</li> <li>• electrical symbols (battery, cell, switch, fuse, voltmeter, ammeter, resistor, filament lamp)</li> <li>• current (A, mA)</li> <li>• voltage (V, mV)</li> <li>• resistance (<math>\Omega</math>, k<math>\Omega</math>)</li> <li>• construct simple series and parallel circuits</li> <li>• measure current and voltage using meters</li> <li>• use the equation: voltage (volts) = current (amps) <math>\times</math> resistance (ohms) <math>V = IR</math></li> <li>• direct current (d.c.) and alternating current (a.c.).</li> </ul> <p>B.2 Power supplies:</p> <ul style="list-style-type: none"> <li>• types of batteries</li> <li>• solar cell</li> <li>• simple generators – rotating a coil in a permanent magnetic field</li> <li>• production of electricity – basic alternating current generator, batteries as a source of direct current (rechargeable and non-rechargeable)</li> <li>• environmental impact – comparison of environmental impact of electricity generation from renewable and non-renewable sources</li> <li>• electrical power and the equation: power (watts) = voltage (volts) <math>\times</math> current (amps) <math>P = VI</math></li> <li>• efficiency of electricity generation from different sources</li> <li>• National Grid – used to transmit electrical energy (power)</li> <li>• step-up and step-down transformers and the reduction of energy losses during transmission.</li> </ul> <p><b>KEY WORDS</b></p>	<p>Students will be carrying on with and finishing up studying forces. They will be studying vehicles and how quickly they can stop. Students will interrogate this through an experiment on bikes, and then visual lessons using resources online about cars stopping.</p> <p>Students will then study energy, energy transfers and energy efficiency. Students will take part in practicals and real-life applications such as questioning why a computer will run out of battery faster when the battery is hot.</p> <p>Students will learn through the use of literacy starters, teaching from first principles (“What is energy, what does it mean to ‘transfer’”), and mastering these first principles before applying it further. I.e. to understand efficiency students need to first understand heat, and wasted energy.</p> <p><b>KEY WORDS:</b></p> <ul style="list-style-type: none"> <li>-Energy</li> <li>-Energy Transfers</li> <li>-Stopping Distance</li> <li>-Efficiency</li> <li>-Renewable</li> <li>-Non-Renewable</li> </ul> <p><b>Literacy Element:</b>          The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with a verbal presentation demonstrating their knowledge of motion and forces throughout the entire Autumn term.</p>



	<p>-electricity          -a.c.          -d.c          -current          -voltage          -environmental          -efficiency</p> <p><b>Literacy Element:</b>          The development of their use of their Scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with a verbal presentation demonstrating their knowledge of motion and forces throughout the entire Autumn term.</p> <p><b>Formal Assessment</b>          Course work – completing the relevant Assignment Briefs for Unit 3.</p>	
<p><b>Spring</b></p>	<p><b>Pearson Edexcel – Unit 3 – Energy and our Universe</b></p> <p>Students will then learn about:          C.1 The Universe:</p> <ul style="list-style-type: none"> <li>• the structure and dynamic nature of the Universe (Solar System, stars and galaxies, large-scale structure)</li> <li>• looking back in time</li> </ul> <p>C.2 The Solar System:</p> <ul style="list-style-type: none"> <li>• composition – stars, planets, dwarf planets and natural satellites, comets and meteors, asteroids</li> <li>• formation of the Solar System</li> </ul> <p>C.3 Observing the Universe:</p> <ul style="list-style-type: none"> <li>• optical, radio, infrared, UV, X-ray and gamma telescopes</li> <li>• reflecting, ground-based and space-based telescopes</li> <li>• space probes and robots</li> </ul> <p>C.4 The changing Universe:</p> <ul style="list-style-type: none"> <li>• the Big Bang theory</li> <li>• evidence for an expanding Universe (galaxies moving away from each other (red shift))</li> <li>• cosmic microwave background radiation as support for the Big Bang theory</li> </ul> <p><b>KEY WORDS:</b>          -Solar system</p>	<p><b>Chemistry: Matter, Atoms and the periodic table.</b></p> <p><u>States of matter</u></p> <p>The arrangement and movement of particles in each of the three states of matter: solid, liquid and gas, the names used for the inner conversations between the three states of matter, the changes in arrangement and movement of particles during these interconversions, and interconversions are physical changes, unlike chemical reactions that result in chemical changes.</p> <p><u>Atomic Structure</u></p> <p>The structure of an atom, the nucleus of an atom as very small compared to the overall size of the atom, the relative charge and relative mass of a proton, neutron and electron and most of the mass of an atom is concentrated in the nucleus.          Atoms of a given element as having the same number of protons in the nucleus and that this number is unique to that element and known as the atomic number, atoms of the same element with different numbers of neutrons are called isotopes.</p> <p><u>The Periodic Table</u></p> <p>Arrangement of elements using properties:</p> <ul style="list-style-type: none"> <li>• increasing atomic number</li> </ul>



	<p>-the big bang theory          -galaxies          -planets          -universe</p> <p><b>Literacy Element:</b>          The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with a display poster that showcases different states of matter and the breakdown of the atomic structure.</p> <p><b>Formal Assessment:</b>          Course work – completing the relevant Assignment Briefs for Unit 3.</p>	<ul style="list-style-type: none"> <li>• similar properties</li> <li>• Metals and non-metals (properties)</li> <li>• Arrangement of electrons</li> <li>• Reactivity</li> </ul> <p><b>KEY WORDS:</b>          -Matter          -Solid          -Gas          -Liquid          -Atoms          -Protons          -Neutrons          -Electrons          -Periodic Table</p> <p><b>Literacy Element:</b>          The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with a display poster that showcases different states of matter</p>
<p><b>Spring 2</b></p>	<p><b>Pearson Edexcel – Unit 2 – Chemistry and Our Earth</b></p> <p>Students will be learning about:</p> <p>A.1 Chemical and physical properties of groups 1 and 7 of the periodic table:</p> <ul style="list-style-type: none"> <li>• trends in physical properties of groups 1 and 7 (appearance, melting point, boiling point, electrical conductivity)</li> <li>• reactivity with water for group 1</li> <li>• displacement reactions for group 7</li> <li>• trends in chemical properties in group 1 and group 7 – relationship with electronic configuration.</li> </ul> <p>A.2 Bonding and structure:</p> <ul style="list-style-type: none"> <li>• formulae of molecules (in A.2b and A.2c)</li> <li>• covalent bonding (hydrogen, chlorine, carbon dioxide, methane, water, oxygen)</li> <li>• ionic bonding (sodium chloride, magnesium oxide, magnesium chloride)</li> <li>• properties of simple molecular, giant covalent and ionic substances.</li> </ul> <p>B.1 Use of chemicals based on their physical properties</p> <ul style="list-style-type: none"> <li>• electrical conductivity</li> <li>• thermal conductivity</li> </ul>	<p><b>Chemistry: Matter, Atoms and the periodic table.</b></p> <p><u>Ionic Bonding</u></p> <p>Understand how ionic bonds are formed between metal and non-metal atoms by the transference of electrons to produce positive and negative ions (Groups 1 &amp; 7)          Describe and draw the ionic compound structure          Describe the properties of ionic compounds</p> <ul style="list-style-type: none"> <li>• High melting points and boiling points</li> <li>• Solubility in water</li> <li>• Conductor of electricity</li> </ul> <p><u>Covalent Bonding</u></p> <p>Understand how Covalent bonds are formed through the sharing of electrons between two non-metal atoms.          Usually results in the formation of simple molecules (Hydrogen, Hydrogen Chloride, Water), however can form giant covalent compounds (Graphite, Diamond).          Describe the properties of simple covalent compounds</p>



	<ul style="list-style-type: none"> <li>• melting and boiling points</li> <li>• solubility in different solvents</li> <li>• viscosity</li> </ul> <p>B.2 Use of chemicals based on their chemical properties:</p> <ul style="list-style-type: none"> <li>• sodium azide in airbags</li> <li>• argon in welding</li> <li>• silicon in computer–chip technology</li> <li>• carbon dioxide in fire extinguishers.</li> </ul> <p><b>KEY WORDS:</b> -formulae -reactivity -periodic table -melting point -boiling point -covalent bonding</p> <p><b>Literacy Element:</b> The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with the production of an annotated periodic table defining groups, rows and atomic keywords.</p> <p><b>Formal Assessment</b> Course work – completing the relevant Assignment Briefs for Unit 2.</p>	<ul style="list-style-type: none"> <li>• Low melting points</li> <li>• Poor conductor of electricity</li> </ul> <p>Describe the properties of giant covalent compounds (graphite, diamond)</p> <ul style="list-style-type: none"> <li>• High melting and boiling point</li> <li>• Poor conduction of electricity (except graphite)</li> <li>• Insoluble in water</li> </ul> <p><u>Metallic Bonding</u> Describe the properties of metals, including:</p> <ul style="list-style-type: none"> <li>• The ability to conduct electricity, because of free moving electrons</li> <li>• Malleability, because layers of metal atoms can slide over each other.</li> </ul> <p><b>KEY WORDS:</b> -Atoms -Protons -Neutrons -Electrons -Periodic Table -Ionic -Ion -Covalent -Metal -Non-metal -Molecular</p> <p><b>Literacy:</b> The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with the production of an annotated periodic table defining groups, rows and atomic keywords.</p>
<p><b>Summer 1</b></p>	<p><b>Pearson Edexcel – Unit 2 – Chemistry and Our Earth</b></p> <p>Students will be studying</p> <p>C.1 Equations:</p> <ul style="list-style-type: none"> <li>• word equations</li> <li>• simple balanced chemical equations (including state symbols: (s), (l), (g), (aq))</li> <li>• recognise reactants and products in a reaction (displacement, combustion, neutralisation reactions)</li> <li>• reversible and irreversible chemical change</li> </ul>	<p><b>Biology - Cells, genetics, inheritance and modification</b></p> <p><u>Cells</u> Describe the functions of the nucleus, cell membrane and cytoplasm in animal cells. Describe the functions of the nucleus, cell membrane, cytoplasm and chloroplast in plant cells. Describe how growth takes place in organisms by cell division in animals and plants, cell elongation in plants. Describe the importance of cell differentiation in the development of specialised cells</p>



	<p>C.2 Reaction rates:</p> <ul style="list-style-type: none"> <li>effect of catalysts (lowering the energy needed for a reaction to occur), surface area, concentration and temperature on rate of reaction</li> <li>use of reaction rate graphs</li> <li>collision theory</li> </ul> <p>C.3 Industrial processes:</p> <ul style="list-style-type: none"> <li>the concept of yield (mass of product obtained) and that the actual yield is less than the theoretical yield</li> <li>altering rates of reaction</li> <li>atom economy.</li> </ul> <p><b>KEY WORDS:</b>          -Equations          -reactions          -symbols          -rate of reaction          -catalysts</p> <p><b>Literacy Element:</b>          The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with a verbal and visual presentation comparing and contrasting 2 specialised cells.</p> <p><b>Formal Assessment</b>          Course work – completing the relevant Assignment Briefs for Unit 2.</p>	<p>Describe how the following specialised cells are adapted to their function, specifically:</p> <ul style="list-style-type: none"> <li>Sperm cells</li> <li>Egg cells</li> <li>Nerve cells</li> <li>Muscle cells</li> </ul> <p>Recall the function of embryonic stem cells to differentiate into all cell types, adult stem cells to maintain and repair the body</p> <p>Recall the functions of the following nerve cells: sensory neurons, relay neurons in the spinal cord, motor neurones</p> <p>Describe the role of neurotransmitters in allowing an impulse to cross a synapse</p> <p>Recall the function of the myelin sheath to insulate neurons</p> <p>Describe the processes involved in a reflex arc, including:</p> <ul style="list-style-type: none"> <li>Receptor cells detecting a stimulus</li> <li>The path taken by the impulse through sensory, relay and motor neurones</li> <li>The impulse arriving at the effector</li> </ul> <p><b>KEY WORDS:</b>          -Cells          -Function          -Nucleus          -Sensory          -Nerves          -Stem Cells          -Specialised</p> <p><b>Literacy Element:</b> The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with a verbal and visual presentation comparing and contrasting 2 specialised cells.</p>
<p><b>Summer 2</b></p>	<p><b>Pearson Edexcel – Unit 2 – Chemistry and Our Earth</b></p> <p>Students will be studying:</p> <p>D.1 Natural activity factors (tectonic plates and volcanic eruptions) influencing:</p> <ul style="list-style-type: none"> <li>the Earth’s crust</li> <li>the evolution of the atmosphere and oceans</li> </ul> <p>D.2 Human activity factors:</p>	<p><b>Biology - Genetics, inheritance and modification</b></p> <p>Recall/understand the structure of DNA as two strands coiled to form a double helix</p> <ul style="list-style-type: none"> <li>DNA is found in a cell’s nucleus, packaged into chromosomes</li> <li>Each chromosome contains several genes</li> <li>A gene is a section of a DNA molecule</li> <li>A gene contains the information needed to make a protein</li> </ul>



<ul style="list-style-type: none"><li>obtaining materials from the sea, land and air, e.g. coal, natural gas, oil, metal ores, salt, nitrogen, oxygen</li><li>production of useful materials from their natural sources</li><li>effects on the environment (local and global effects)</li><li>effects of chemical processing (energy factors, health and safety, disposal)</li></ul> <p>D.3 Sustainable development issues:</p> <ul style="list-style-type: none"><li>human choices (recycling, use of fossil fuels versus nuclear fission fuels)</li><li>human solutions (renewable energy, biofuels (ethanol), nuclear fusion).</li></ul> <p><b>KEY WORDS:</b> -Natural sources -earth's crust -tectonic plates - sustainability</p> <p><b>Literacy:</b> The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with a detailed posted using the keywords to describe the evolution of a certain animal.</p> <p><b>Formal Assessment</b> Course work – completing the relevant Assignment Briefs for Unit 2.</p>	<p>Understand the terms linked to genetic inheritance: allele, dominant, recessive. Understand the process of monohybrid inheritance.</p> <p>Recall/understand that a person's sex is determined at fertilisation by the inheritance of an X chromosome from the mother, and either a X chromosome (in girls) or a Y chromosome (in boys) from the father</p> <p><u>Variation</u></p> <ul style="list-style-type: none"><li>Differences in characteristics within organisms in a species. Genetic variation is the variation that arises because organisms inherit different combinations of alleles from their parents. Genetic variation mostly occurs because of small changes to the structure of DNA, known as a mutation</li><li>Environmental variation as the variation that arises because an organism's environment makes it develop different characteristics (Darwin's theory of evolution by natural selection)</li><li>Process of selective breeding, including:<ul style="list-style-type: none"><li>Producing wheat that is resistant to disease</li><li>Producing cows with a high yield of milk</li></ul></li><li>Genetic engineering as a process that involves modifying the DNA of an organism to introduce desirable characteristics. Describe the benefits and risks of genetic engineering.</li></ul> <p><b>KEY WORDS:</b> -Cells -DNA -Chromosome -Allele -Variation -Selection</p> <p><b>Literacy Element:</b> The development of their use of their scientific vocabulary and nomenclature is paramount to the teaching of Science in the Courtyard. This will start with Literacy starters and finish with a detailed posted using the keywords to describe the evolution of a certain animal.</p> <p><b>Formal Assessment:</b> Externally marked paper assessment</p>
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