



Science Scheme of Learning

Year 7 – Term 4/Units 4

Intent – Rationale

Building on students understanding of ecosystems they learn about the variety of life and the causes of variation between organisms of the same species. Students learn about the concept of a pure substance, mixtures, including dissolving, diffusion in terms of the particle model, simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography and the identification of pure substances. Students consider energy resources and learn about energy resources that are renewable and non-renewable.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
<p>KS2 NC Y6 Living things and their habitats and Evolution and inheritance KS2 NC Y5 Properties and changes of materials Topic B7.3 Environment and adaptation Topic C7.1 Particles Topic C7.2 Atoms and Elements Topic P7.1 Energy Transfers</p>	<ul style="list-style-type: none"> • Topic B8.10 Inheritance and evolution. Topic C7.6 Compounds, C8.8 Extracting metals and C8.10 Describing reactions. • GCSE Units B14 Variation and Evolution, B15 Genetics and Evolution, B16 Adaptation, Interdependence and Competition, B17 Organisation of an ecosystem and B18 Biodiversity and ecosystems. • GCSE Chemistry Topic 1 Atomic Structure and the Periodic Table, Topic 7 Organic Chemistry, Topic 8 Chemical Analysis and Topic 10 Using Resources • GCSE Physics P3 Energy resources, P15 Electromagnetism
What are the links with other subjects in the curriculum?	What are the links to SMSC, British Values and Careers?
<ul style="list-style-type: none"> • Base the content here on what you already know but there will be time in future to liaise further as part of our collaborative work 	<ul style="list-style-type: none"> • SMSC M fossil fuel adv/dis
What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?	What are the opportunities for developing mathematical skills?
<ul style="list-style-type: none"> • FROM THE LIBRARY ECOSYSTEMS AND ENVIRONMENT; a Fullick-577 <i>An Inconvenient Truth</i>; Al Gore-363.73 <i>Air Pollution: Our Impact on the Planet</i>; Chapman, Matthew & Bowden-363.73 <i>Energy, Resources and Environment</i>; J. Blunden-333.79 <i>Fuels for the Future</i>; Steve parker-620 <i>Elephants on Acid and other Bizarre Experiments</i>; Alex Boese-500 <i>Really Rotten Experiments</i>-500 	<ul style="list-style-type: none"> • Percentage • Graph drawing • Range, mean



Science Scheme of Learning

Year 7 – Term 4

Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?																		
<p style="text-align: center;">Know</p> <ul style="list-style-type: none"> Describe how scientists classify organisms. Explain what variation is. Describe how genetic factors affect variation. Describe how environmental factors affect variation. Use the term pure and impure appropriately. The meaning of the terms solute, solvent and solution. Describe the processes of filtration, evaporation, distillation. Understand that distillation can be used to separate a liquid from the solids, which are dissolved in it. Describe the differences between fossil fuels and biomass. Describe how electricity is generated from fossil fuels in power stations. Explain how electricity is generated from renewable energy - water. Explain how electricity is generated from renewable energy – sun and wind <p style="text-align: center;">Apply</p> <ul style="list-style-type: none"> Know how to use a key to identify plants and animals. Give examples of characteristics which show continuous and discontinuous variation. Knowledge of variation to population statistics. Identify a correlation between two variables. Use particle diagrams to identify substances as pure, impure or mixtures. Describe what happens to particles during dissolving and evaporation. Select which separation techniques to use to make pure salt from rock salt. Explain how distillation occurs. Energy from the sun to energy flow diagrams. Explain how electricity is generated from fossil fuels in power stations. Identify and modify variables to plan an effective experiment. Understand where the energy comes from in each renewable source <p style="text-align: center;">Extend</p> <ul style="list-style-type: none"> Describe the hierarchy of classification in animals and plants. Describe continuous and discontinuous variation. Explain why children have similar features to their parents but not are identical to either of them. Describe how to test whether a substance is pure. Explain why mass is conserved during dissolving. Explain which separation technique would be suitable for separating a given mixture. explain how a Liebig Condenser works to distil a solvent from a solution. Explain how all energy originally came from the Sun. Evaluate the advantages and disadvantages of using fossil fuels. Evaluate the advantages and disadvantages of generating electricity from water. Evaluate the advantages and disadvantages of generating electricity from the sun and wind. 																		
What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Continuous variation</td> <td>A type of variation within a species in which the thing being measured can have any value within a range, rather than being able to fit into discreet groups.</td> </tr> <tr> <td>Discontinuous variation</td> <td>When a measured value can only have a fixed number of values, with no values in between.</td> </tr> <tr> <td>Environmental variation</td> <td>Variation in individual organisms within a species that is caused by environmental (not genetic) factors.</td> </tr> <tr> <td>Gene</td> <td>A section of DNA that controls one inherited characteristic of an organism. A gene contains the code for building one type of protein molecule.</td> </tr> <tr> <td>Genetic engineering</td> <td>The transfer of genes from one organism to another in order to transfer a useful characteristic. This is also known as genetic modification (GM).</td> </tr> <tr> <td>Genetic variation</td> <td>Variation between individuals within a species that is caused by genes instead of the environment. This is also called ‘inherited variation’.</td> </tr> <tr> <td>Inherit</td> <td>To receive a characteristic from parents due to genes passed from parents to offspring. You can inherit things such as the shape of facial features as well as eye colour and blood group.</td> </tr> <tr> <td>Inherited variation</td> <td>Variation in organisms that is controlled by genes rather than the environment. It can also be called ‘genetic variation’.</td> </tr> </table>	Continuous variation	A type of variation within a species in which the thing being measured can have any value within a range, rather than being able to fit into discreet groups.	Discontinuous variation	When a measured value can only have a fixed number of values, with no values in between.	Environmental variation	Variation in individual organisms within a species that is caused by environmental (not genetic) factors.	Gene	A section of DNA that controls one inherited characteristic of an organism. A gene contains the code for building one type of protein molecule.	Genetic engineering	The transfer of genes from one organism to another in order to transfer a useful characteristic. This is also known as genetic modification (GM).	Genetic variation	Variation between individuals within a species that is caused by genes instead of the environment. This is also called ‘inherited variation’.	Inherit	To receive a characteristic from parents due to genes passed from parents to offspring. You can inherit things such as the shape of facial features as well as eye colour and blood group.	Inherited variation	Variation in organisms that is controlled by genes rather than the environment. It can also be called ‘genetic variation’.	<ul style="list-style-type: none"> Assessment of graph plotting opportunities: B7.4 L3 and 4, C7.4 L2 Research task: P7.4 L4 Researching energy resources for electricity Topic 4 summative test – overall understanding of content and the ability to apply to unfamiliar contexts. 	
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Invertebrate	An animal without a backbone. The vast majority of animals (around 97%) are invertebrates because it is only mammals, birds, fish, reptiles and amphibians that have a backbone.
Micro-organism	A living thing that is too small to be seen with the naked eye, so it must be observed and studied using some sort of microscope.
Population	The number of organisms of one species that lives within a particular space.
Variation	Differences between individuals within a species. Variation can be continuous or discontinuous.
Vertebrate	An animal that has a backbone. Approximately 3% of animals are vertebrates
Atom	The smallest particle of an element
Compound	A pure substance made from more than one element in which the atoms combine in a fixed ratio.
Concentration	A measure of the amount of solute (solid) dissolved in a solvent (liquid).
Dissolve	When a substance known as a solute is mixed with a liquid known as a solvent (often water) so that the particles break up into individual atoms, molecules or ions and spread evenly through the liquid
Evaporation	When a liquid turns into a gas below its boiling point.
Freezing	The process when a liquid changes into a solid.
Immiscible	Two liquids are described as immiscible if they will not mix together.
Impurity	An unwanted substance that is mixed in with a desirable substance.
Insoluble	When a solid or gas does not dissolve in a specific solvent.
Melting	The change of state when a solid becomes a liquid.
Miscible	When two liquids are able to mix together to form a uniform mixture, rather than separating out.
Mixture	A substance that is made from more than one element or compound that are not chemically bonded to each other.
Properties	The characteristics of a substance that make it well suited (or poorly suited) for a particular purpose.
Pure	A substance made from only one compound or element
Saturated	When applied to a solution, this term means that at a given temperature, no more solute will dissolve in a solution.
Solubility	The maximum amount of a solute that will dissolve in a given volume of solvent (usually water).
Soluble	Describes a solid or gas that will dissolve in a given solvent.
Solute	The substance that has dissolved in a solvent to form a solution.
Solution	A mixture formed when a solute has dissolved in a solvent.
Solvent	The liquid in a solution.
Acid rain	Rain that is acidic, as a result of either naturally occurring or human-made chemicals that have dissolved in rainwater.
Biofuel	A fuel that has been made from a crop grown for that purpose. Most diesel is separated from crude oil, but biodiesel can be made from oils derived from crops such as oil seed rape. Bioethanol can be made from crops such as sugar cane. This is very useful in countries such as Brazil, where the climate is perfect for growing sugar cane but they have very little crude oil.
Biomass	A source of renewable energy. Biomass is usually wood that has been grown for the purpose of burning it to release energy. This is a renewable way to harness energy from the Sun, because this energy is transformed through photosynthesis into chemical stored energy. Aside from the energy used to harvest and process the crops, this should be a carbon neutral way of providing energy for homes and businesses.



Carbon neutral	A process that overall does not cause the release of carbon dioxide into the atmosphere, which would contribute to global warming. Many processes are carbon neutral in theory, but not in practice. For example, growing oil seed rape to turn into biodiesel should absorb carbon dioxide as the plants grow and release it again when the biodiesel is burnt. However, if energy obtained from fossil fuels is used in the planting and harvesting of the crop, the processing of the crop to make oils and the chemical treatment of the oils to make biodiesel, then the fuel is not strictly speaking carbon neutral.
Chemical store	Energy that is stored within chemicals and can be released during an exothermic chemical reaction. For example, petrol has a large chemical store of energy because it is able to release a lot of energy when it is burnt.
Climate change	Long-term patterns in very large-scale weather systems. The weather may change from day to day, and from place to place in a country or continent. Climate change is more concerned with global average temperatures and weather systems that affect huge areas of the Earth. Global warming is an example of climate change.
Energy resource	A substance or process that can be harnessed to provide useful energy for human populations. This usually involves transforming the energy into electricity. Examples of energy resources include solar, nuclear, fossil fuels, geothermal, hydroelectric and wind.
Erosion	When rocks wear away by the action of the wind, rain, ice and rivers and the particles are transported away to another place.
Fossil fuels	Fuels that have been formed in the Earth's crust over millions of years due to the action of pressure on the remains of living things that have been buried under sediments without enough oxygen for them to fully decompose to carbon dioxide. Examples of fossil fuels include coal, oil and natural gas (methane).
Fuel	Any substance that can be burnt to release chemical energy as heat. Fuels react with oxygen in combustion reactions. Examples of fuels include natural gas, wood, coal, ethanol, petrol and diesel.
Generator	A device that converts kinetic energy into electrical energy. In a power station, the generator is connected to the spinning turbine, and it consists of a magnet and a coil of wire spinning relative to each other. In many modern generators, the magnet is actually an electromagnet powered by direct current, spinning inside a larger coil. The induced current is generated in the larger coil.
Geothermal power	Using thermal energy from the Earth's crust to produce electricity or to provide heating for homes and businesses. Geothermal power is only possible in places with volcanic activity, such as Iceland, which produces 30% of its electricity from geothermal energy.
Global warming	The warming of the Earth's atmosphere and oceans as a result of increasing the greenhouse effect. This has occurred due to the emission of greenhouse gases such as carbon dioxide and methane as a result of human activity.



Hydroelectric power (HEP)	<p>Using running water to generate electricity. This is usually achieved by building a dam across a river high up in the mountains and then allowing this water to travel down a pipe, converting energy from its gravitational potential store to its kinetic store. It can then be used to spin a turbine connected to a generator.</p> <p>Hydroelectric power stations are often found in mountainous areas of the UK such as the Scottish Highlands and North Wales.</p>	
Non-renewable energy resource	<p>An energy resource that will eventually run out if we continue to use it. It can also be described as being 'finite' (the opposite of infinite).</p> <p>Examples of non-renewable energy resources include coal, oil and natural gas.</p>	
Nuclear fuel	<p>An element used in nuclear power stations to generate electricity. Radioactive decay of these elements is used to heat water. The steam produced is then used to drive a turbine connected to a generator.</p> <p>Examples of nuclear fuels are uranium and plutonium.</p>	
Renewable energy resource	<p>An energy resource that will never run out (within the lifetime of humans).</p> <p>Examples of renewable energy resources include solar, wind, hydroelectric and geothermal.</p>	
Turbine	<p>A large machine that resembles a jet engine. When steam from a power station's boiler passes through it the turbine spins, and this spins a generator to make electricity.</p>	
Wind turbine	<p>A device for using the wind's kinetic store of energy to generate electricity.</p>	



Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
B7.4 L1 The Variety of Life	Can I describe how scientists classify organisms?	Can I describe the hierarchy of classification in animals and plants?	
B7.4 L2 Variation in living things	Can I explain what variation is?	Can I describe continuous and discontinuous variation?	
B7.4 L3 Genetic Variation	Can I describe how genetic factors affect variation?	Can I explain why children have similar features to their parents but not are identical to either of them?	
B7.4 L4 Environmental Variation	Can I describe how environmental factors affect variation?	Can I identify a correlation between two variables?	
C7.4 L1 Pure and Impure substances	Can I use the term pure and impure appropriately?	Can I describe how to test whether a substance is pure?	
C7.4 L2 Dissolving and solutions	Can I state the meaning of the terms solute, solvent and solution?	Can I Explain why mass is conserved during dissolving?	
C7.4 L3 Separating Mixtures	Can I describe the processes of filtration, evaporation, distillation?	Can I explain which separation technique would be suitable for separating a	



		given mixture?	
C7.4 L4 Separating Mixtures - Distillation	Can I understand that distillation can be used to separate a liquid from the solids, which are dissolved in it?	Can I explain how a Liebig Condenser works to distil a solvent from a solution?	
P7.4 L1 Energy from the sun	Can I describe the differences between fossil fuels and biomass?	Can I explain how all energy originally came from the Sun?	
P7.4 L2 Energy from fossil fuels	Can I explain how electricity is generated from fossil fuels in power stations?	Can I evaluate the advantages and disadvantages of using fossil fuels?	
P7.4 L3 Energy from moving water	Can I explain how electricity is generated from renewable energy - water?	Can I evaluate the advantages and disadvantages of generating electricity from water?	
P7.4 L4 More renewable resources	Can I explain how electricity is generated from renewable energy – sun and wind?	Can I evaluate the advantages and disadvantages of generating electricity from the sun and wind?	
Topic 4 Test	Summative test		