

## Science progression of knowledge- Chemistry (substantive knowledge)

Year Group	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Area of Study								
<p><b>Chemistry</b></p> <p><b>Everyday Materials and states of matter</b></p> <p><b>Rocks</b></p>	<p>To explore collections of materials with similar and/or different properties.</p> <p>To talk about the differences between materials and changes they notice.</p> <p>To explore how things work.</p> <p>To talk about what they see, using a wide vocabulary.</p>	<p>To understand some important processes and changes in the natural world around them, including changing states of matter.</p>	<p>To distinguish between an object and the material from which it is made</p> <p>To identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock</p> <p>To describe the simple physical properties of a variety of everyday materials</p> <p>To compare and group together a variety of everyday materials on the basis of their simple physical properties</p>	<p>To identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses</p> <p>To find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching</p>	<p>To compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</p> <p>To describe in simple terms how fossils are formed when things that have lived are trapped within rock</p> <p>To recognise that soils are made from rocks and organic matter</p>	<p>To compare and group materials together, according to whether they are solids, liquids or gases</p> <p>To observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)</p> <p>To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature</p>	<p>To compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets</p> <p>To know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</p> <p>To use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</p> <p>To give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</p> <p>To demonstrate that dissolving, mixing and changes of state are reversible changes</p> <p>To explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda</p>	
<b>Famous Scientists</b>	Charles Macintosh (1868 - 1928)		John McAdam (1756-1836)	Charles Macintosh (1868 - 1928)	William Smith (1769 -1839)  Mary Anning (1799- 1847)	Sir William Thomson Lord Kelvin (1824 - 1907)	Stephanie Kwolek (1923-2014) Ruth Benerito (1916-2013)	
<b>Investigations</b>	<p>What happens to popcorn when you cook it?</p> <p>What happens to snow/ice and why?</p> <p>What do you do to make chocolate melt?</p> <p>What make a material waterproof and not waterproof?</p>		<p><b>Modelled investigation</b></p> <p><b>Classifying</b></p> <p>Sort materials into groups on the basis of their simple physical properties</p>	<p><b>Independent Investigation</b></p> <p><b>Fair test</b></p> <p>Which material will be most suitable for a pirate's coat?</p>	<p><b>Intermediate investigation</b></p> <p><b>Classifying</b></p> <p>Compare and group together different kinds of rocks based on their</p>	<p><b>Modelled investigation</b></p> <p><b>Classifying</b></p> <p>Which materials are solids, liquids and gases?</p> <p><b>Modelled investigation</b></p> <p><b>Observation over time</b></p>	<p><b>Modelled investigation</b></p> <p><b>Fair test</b></p> <p>How do we know when a substance has dissolved in a liquid?</p> <p><b>Intermediate investigation</b></p> <p><b>Fair test / observation over time</b></p>	

	<p>What happens to the liquid pancake batter when you cook it?</p> <p>Can they process be reversed?</p> <p>Different substances - sugar, oil, salt, food colouring, rice and flour. Which dissolve and which do not dissolve.</p>	<p><b>Intermediate investigation</b> <b>Classifying</b> Are these materials waterproof or not?</p> <p><b>Modelled investigation</b> <b>Fair test</b> What happens to playdough when it is at different temperatures?</p>		<p>appearance and simple physical properties.</p> <p><b>Independent investigation</b> <b>Classifying</b> Classify these rocks into Sedimentary, Metamorphic and Igneous.</p> <p><b>Independent Investigation</b> <b>Fair test</b> If we change the rock type what will happen to the water on the rock?</p> <p><b>Independent Investigation</b> <b>Classifying</b> Which rocks are hard and which are soft?</p> <p><b>Intermediate investigation</b> <b>Fair test</b> If we change the type of soil what will happen to the amount of water drained through the soil?</p>	<p>If we change the temperature, what will happen to the amount of water?</p> <p><b>Intermediate investigation</b> <b>Fair test</b> If we change the type of liquid will the boiling point change?</p> <p><b>Independent investigation</b> <b>Fair test</b> Own question</p>	<p>Which materials can be recovered when dissolved in water to form a solution?</p> <p><b>Intermediate investigation</b> <b>Fair test</b> How does heat effect different materials?</p> <p><b>Independent investigation</b> <b>Fair test</b> Own question</p>	
<b>Vocabulary</b>	hot, cold, waterproof, not waterproof, melting, solid, liquid, freeze, cook, heat up.	object, material, hard, soft, stretchy, shiny, dull, rough, smooth, bendy, waterproof, absorbent, transparent, opaque	materials, properties, suitability, purpose, squash, bend, twisting, stretch, waterproof, flexible, stiff, transparent, absorbent	sedimentary rock, igneous rock, metamorphic rock, permeable, impermeable, magma, lava, sediment, fossilisation, erosion	states of matter, solids, liquids, gases, water vapour, melt, freeze, evaporate, condense, precipitation,	materials, solids, liquids, gases, melting, freezing, evaporating, condensing, conductor, insulator, transparency	
<b>Misconceptions</b>		Plastic is always hard.		<p>Rocks are all hard</p> <p>Rocks are all made in the same way</p> <p>Rocks are all the same and it's hard to tell where they came from or how they came about</p> <p>Brick and concrete are examples of rocks</p>	<p>Gases are not matter because most are invisible.</p> <p>Air and oxygen are the same gas.</p> <p>All liquids boil at 100°C (212°F) and freeze at 0°C (32°F).</p> <p>The water in puddles simply disappears</p> <ul style="list-style-type: none"> <li>• the water turns into air</li> <li>• only small puddles will evaporate</li> <li>• the sun must be out for the water to evaporate.</li> </ul> <p>Candle - wax does not burn, it just melts.</p>	<p>Materials can only exhibit properties of one state of matter.</p> <p>Melting and dissolving are the same thing.</p> <p>When substances dissolve in water, they disappear.</p> <p>Solutions cannot be separated.</p>	
<b>Texts, rhymes and songs</b>	<p>Goldilocks and the Three Bears</p> <p>The Run Away Pancake by Mairi Mackinnon</p> <p><b>Non-Fiction</b></p>		<p>Stone Underpants by Rebecca Lisle</p> <p>Three little pigs</p> <p>Woolly Saucepan by Michael Rosen (Poem)</p> <p><b>Non-Fiction</b></p>	<p>The Street Beneath My Feet by Charlotte Guillain and Yuval Zommer</p> <p><b>Non-Fiction</b></p>	<p>Charlie and the Chocolate Factory (see <a href="http://www.stem.org.uk/teaching-science-through-stories">www.stem.org.uk/teaching-science-through-stories</a> )</p> <p><a href="#">States of Matter poem</a> by Michael Rosen</p> <p><b>Non-Fiction</b></p> <p>States of Matter (Science in a Flash)</p> <p>Changing from solids to liquids to gases (Curriculum Visions - Science @ School)</p>	<p>George's Marvellous medicine by Roald Dahl</p> <p><b>Non-Fiction</b></p> <p>Properties and Changes of Materials by Nichola Tyrrell</p> <p>A World of Information by Richard Platt &amp; James Brown</p> <p>Women in Science: 50 Fearless Pioneers</p> <p>Who Changed the World by Rachel Ignotofsky</p>	

						Stephanie Kwolek: Creator of Kevlar (Innovators) by Gail B Stewart	
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