Year 5 – Properties & Changes of Materials



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| National Curriculum Outcomes: Knowledge   * 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 * Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution * Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating * Give reasons based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic * Demonstrate that dissolving, mixing and changes of state are reversible changes * 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 | | | | | | | | National Curriculum Outcomes: Working Scientifically   * Asking simple questions and recognising that they can be answered in different ways * Observing closely, using simple equipment * Performing simple tests * Identifying and classifying * Using their observations and ideas to suggest answers to questions * Gathering and recording data to help in answering questions | |
| Children might work scientifically by:  Carrying out tests to answer questions, for example, ‘Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?’ They might compare materials in order to make a switch in a circuit. They could observe and compare the changes that take place, for example, when burning different materials or baking bread or cakes. They might research and discuss how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials. (*taken from the National Curriculum*) | | | | | | | |
| Links to prior learning  **Year 1**: distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock. Describe the simple physical properties of a variety of everyday materials. Compare and group together a variety of everyday materials on the basis of their simple physical properties.  **Year 3**: compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials.  **Year 4**: compare and group materials together, according to whether they are solids, liquids or gases  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). | | | | | | | Links to future learning  **KS3:** Chemical reactions as the rearrangement of atoms. Combustion, thermal decomposition, oxidation and displacement reactions. Representing chemical reactions using formulae and using equations. Defining acids and alkalis in terms of neutralisation reactions. The pH scale for measuring acidity/alkalinity and indicators | | |
| Key Vocabulary  Material, solid, liquid, gas, change of state, physical change, chemical change, reversible change, irreversible change, hardness, solubility, transparency, thermal conductivity, electrical conductivity, magnetic, dissolve, solution, separate, filtering, sieving, evaporating | | | | | Common Misconceptions   * thermal insulators keep cold in or out * thermal insulators warm things up * solids dissolved in liquids have vanished and so you cannot get them back * lit candles only melt, which is a reversible change | | | | |
| Important Scientists  **Ruth Benerito –** American chemist who invented wrinkle-free cotton | | STEM Career Links  **Architect** (designs buildings)  **Builder** (builds your structures)  **Chemical engineer** (solves problems involving chemicals)  **Materials Scientist** (researches structures and properties of materials) | | | Links to real life   * What is the best material to make my water bottle/lunch box/scrunchie out of? * Which materials are most common in our classroom/homes? * What if we didn’t have this material? * Which materials can we recycle in our area? Why is this important? | | | | |
| Key knowledge/facts that the children need to know   * Materials can be grouped on the basis of their properties and through tests analysing their hardness, permeability; flexibility, solubility, transparency, conductivity (electrical and thermal), and response to magnets: * Know that some materials will dissolve in liquid to form a solution. * You can recover a substance from a solution by evaporation of the liquid. * Some materials will not dissolve. * A material that dissolves is called a solute, the liquid it is dissolved in is a solvent.  The resulting mixture is a solution. * A solution is saturated when no more solid will dissolve in it * Mixtures can be separated through filtering, sieving and evaporating.  Water is purified with these methods. * Materials have different purposes depending on their properties eg:  metal is a good thermal conductor, wood a useful thermal insulator; plastic is light, cheap and non-permeable * Dissolving, mixing and changes of state such as evaporation, melting and freezing (solidification) are reversible changes (physical changes) * Chemical 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 or in cooking eg: pancakes, making omelettes, cooking pasta, baking bread, * Chemical changes can be created by burning, mixing or heating | | | | | | | | | |
| **Suggested Enquiry Activities** | | | | | | | | | |
| Pattern Seeking   * How much of different solutes can be dissolved in water? * Are thicker materials better thermal insulators? | Pattern Seeking   * How much of different solutes can be dissolved in water? * Are thicker materials better thermal insulators? | | Pattern Seeking   * How much of different solutes can be dissolved in water? * Are thicker materials better thermal insulators? | | | Pattern Seeking   * How much of different solutes can be dissolved in water? * Are thicker materials better thermal insulators? | | | Pattern Seeking   * How much of different solutes can be dissolved in water? * Are thicker materials better thermal insulators? |
| **Outdoor Learning** | | | | | | | | | |
| * Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. * Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching | | | | * Pupils talk about objects in the playground or local environment and identify the materials they are made from and how this makes them appropriate for use outside. * Pupils explore whether they can change the shape of objects found in the playground or local environment * Nature Play Activity: create a house for a mouse | | | | | |

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| Wow Factor Experiences   * Build and launch bottle rockets (see weblinks below) – good link to forces learning * Create baking powder volcanoes * Investigate irreversible changes with baking | | |
| Maths Links   * Take precise measurements of different solids and liquids when carrying out investigations * Investigate thermal insulators and take precise measurements of temperature using a thermometer or data logger. This information can then be plotted on a line graph | Literacy Links   * Write a set of instructions explaining how to build a bottle rocket or baking powder volcano | Broader Curriculum Links  **History:** What changes (chemical or changes of state) take place when preparing Mayan hot chocolate? |
| Story Links  Itch – Simon Mayo | | |
| Helpful Weblinks  Bottle Rocket Instructions – <https://www.bbc.co.uk/teach/terrific-scientific/KS2/zr63d6f>  Assessment exemplification (could also be useful with planning ideas) – <https://www.planassessment.com/product-page/examples-of-work-properties-and-changes-of-materials-diogjena>  Teacher CPD on this unit (free) – <https://www.reachoutcpd.com/courses/upper-primary/changing-materials/>  BBC Class Clips (useful videos) – <https://www.bbc.co.uk/bitesize/topics/zcvv4wx/resources/1>  STEM Learning collection of resources for planning and teaching forces – <https://www.stem.org.uk/resources/community/collection/12742/year-5-properties-materials> | | |

NB: This is a topic with a vast amount of content, so **it would be useful to set aside a full term to teach it**. Also, **children could make bottle rockets and apply their learning about forces** if they have already covered this module