# Science

## Year 5 – Aut 2 – Properties and Changes of Materials

| *National Curriculum / End Point Statement* |
|---|
| ***Properties and Changes of Materials***<br>• *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*<br>• *know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution*<br>• *use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating*<br>• *give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic*<br>• *demonstrate that dissolving, mixing and changes of state are reversible changes*<br>• *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*<br>***Working Scientifically***<br>• *planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary*<br>• *taking measurements, using a range of scientific equipment, with increasing accuracy and precision*<br>• *recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs*<br>• *using test results to make predictions to set up further comparative and fair tests*<br>• *reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations identifying scientific evidence that has been used to support or refute ideas or arguments.* |

| *Step 1* | *Step 2* | *Step 3 (TAPS) Insulation Layers* | *Step 4 TAPS) Champion Tape* | *Step 5 Problem solving enquiry* | *Step 6* |
|---|---|---|---|---|---|
| Reactivations: What do the children remember about properties of materials from Autumn 1.<br><br>WALT: describe irreversible changes. | WALT: explain how irreversible changes can result in new materials. (Spencer Silver – Post its) | WAL: about thermal conductivity. | WALT: present our findings to answer a given question. | WALT: plan our own investigation.<br>What is the best way to clean up the Beach/Antarctic? | WALT: carry out our investigation. |
| *In Focus - https://explorify.uk/en/activities/have-you-ever/burnt-your-toast* | *In Focus - https://explorify.uk/en/activities/listen-what-can-you-hear/feeling-hot-hot-hot* | *In Focus - https://explorify.uk/en/activities/whats-going-on/hot-or-cold* | *In Focus - https://explorify.uk/en/activities/odd-one-out/fit-for-purpose* | *In Focus - https://explorify.uk/en/activities/mystery-bag/interesting-insulators* | *In Focus -* |

# Science

## Year 5 – Aut 2 – Properties and Changes of Materials

| Success Criteria | | | | | |
|---|---|---|---|---|---|
| I know what an irreversible change is<br>I can apply my knowledge of the changes to explain whether frying an egg/toasting some bread is reversible/ irreversible<br>I can give examples of melting to show a reversible and irreversible change | I know what an irreversible change is<br>I can give an example of an irreversible change.<br>I know that an irreversible change can result in new materials. | I know what thermal conductivity is<br>I can plan a fair test<br>I can control the relevant variables<br>I can identify which material is the best insulator.<br>I can explain why it would be the best insulator. | I can explain the outcomes of a test.<br>I can explain what I have found out.<br>I can present results. | I can plan a test<br>I know what equipment I will need to carry out my test<br>I can plan a test to solve a problem. | I can carry out an investigation that I have planned.<br>I can describe what I have found out.<br>I can suggest a solution to a problem. |
| **Suggested Outcome** | | | | | |
| Teacher use bicarb and vinegar to create an erupting volcano to demonstrate an irreversible change. Use the reaction with a balloon over the top of the bottle to show a new material being made (links to next lesson)<br><br>Children can name everyday examples such as - frying an egg, vinegar and bicarbonate of soda (produces CO2), toast – Make them everyday changes to build science capital! | Children research and learn about the accidental creation of post its. They could write a brief biography or timeline of the events that led to the discovery. | Children use evidence from the first test to support their prediction. They carry out a fair test independently. From their own findings, they identify which material is the best insulator, e.g. this one because it took longer to cool. | Children can explain which tape is best and why their findings are reliable (used repeat readings) and fair (identifies variables which were kept the same), e.g. we used the same amount of tape to make sure it was fair, and we tried each a few times. We know that the duct tape was the champion as the stickier the tape, the more weight it held before it came off. It took ___g before the duct tape came away and this was the biggest. | Children use their knowledge from the unit of learning to plan an investigation whereby they clean up an area after it has been polluted – could be a local area (Portreath beach and sea water) or link to the topic and link to a base camp in Antarctica (question will need amending) If using Antarctic, ice may be needed –ice and pebbles could be used as a mixture. | Children need to use their knowledge of solids, liquids and gases to separate mixtures through filtering, sieving and evaporating.<br>Children record their results and discuss what went well and what they could improve on/do differently next time. |

| Vocabulary | NC links |
|---|---|
| evaporating, filtering, sieving, melting, dissolving, liquid, solid, gas, substance, chemical, reaction, combine, reversible, irreversible, solvent, state, mixing, mixture, hardness, solubility, transparency, conductivity, electrical, thermal, burning, acid, solution | DT – suitability of material for purpose<br>Geography - biomes |

| Key Learning |
|---|
| Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. |

# Science

## Year 5 – Aut 2 – Properties and Changes of Materials

*Mixtures can be separated by filtering, sieving and evaporation.*
*Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.*

| Possible Evidence | Common Misconceptions |
|---|---|
| • Can use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings<br>• Can explain what dissolving means, giving examples<br>• Can name equipment used for filtering and sieving<br>• Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving<br>• Can describe some simple reversible and non-reversible changes to materials, giving examples<br>• Can create a chart or table grouping/comparing everyday materials by different properties<br>• Can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose<br>• Can group solids based on their observations when mixing them with water<br>• Can give reasons for choice of equipment and methods to separate a given solution or mixture such as salt or sand in water<br>• Can explain the results from their investigations | Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.<br>Some children may think:<br>• thermal insulators keep cold in or out<br>• thermal insulators warm things up<br>• solids dissolved in liquids have vanished and so you cannot get them back<br>• lit candles only melt, which is a reversible change. |

**Notable Scientists**

Sir Humphry Davy
Jamie Garcia (invention of a new plastic)
Becky Schroeder (fluorescence material)
Spencer Silver, Arthur Fry and Alan Amron (post it notes)
Ruth Benerito (wrinkle free cotton)

**CPD opportunity**

https://www.reachoutcpd.com/courses/upper-primary/changing-materials/

**Useful Links**

- https://central.espresso.co.uk/espresso/modules/curriculum_browse/index.html?subject=nc2014:classification:862752&grade=y5
- https://www.bbc.co.uk/bitesize/topics/zcvv4wx
- https://www.stem.org.uk/resources/community/collection/12742/year-5-properties-materials

# Science

## Year 5 – Aut 2 – Properties and Changes of Materials

### Materials

| | |
|---|---|
| **Early learning goal** | • Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. |
| **Year 1** | • Distinguish between an object and the material from which it is made.<br>• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.<br>• Describe the simple physical properties of a variety of everyday materials.<br>• Compare and group together a variety of everyday materials on the basis of their simple physical properties. |
| **Year 2** | • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.<br>• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. |
| **Year 3** | • Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Y3 - Rocks)<br>• Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks)<br>• 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. (Y3 - Forces and magnets) |
| **Year 4** | • Compare and group materials together, according to whether they are solids, liquids or gases.<br>• 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).<br>• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.<br>• Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity) |