C.E.SCHOOL	**Year** 5	**Topic:** Properties and changes of materials

National Curriculum links:

- 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 andevaporating.
- 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, includingchanges associated with burning and the action of acid on bicarbonate of soda.

Prior learning	Future learning
• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard forparticular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses ofeveryday materials) • Compare and group together a variety of everyday materials on the basisof whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets) • Compare and group materials together, according to whether they aresolids, liquids or gases. (Y4 - States of matter) • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happensin degrees Celsius (°C). (Y4 - States of matter) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - Statesof matter)	• Chemical reactions as the rearrangement of atoms. (KS3) • Representing chemical reactions using formulae and using equations.(KS3) • Combustion, thermal decomposition, oxidation and displacementreactions. (KS3) • Defining acids and alkalis in terms of neutralisation reactions. (KS3) • The pH scale for measuring acidity/alkalinity; and indicators. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	**Possible evidence**
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 insolubleand form sediment. 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 resultin the formation of new materials and these are not reversible.	• Can use understanding of properties to explain everyday uses of materials, for example, how bricks,wood, glass and metals are used in buildings • Can explain what dissolving means, giving examples • Can name equipment used for filtering and sieving

Key vocabulary	
Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble,insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material	• Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutionsor mixtures by evaporation, filtering or sieving Can describe some simple reversible and non-reversible changes to materials, giving examples

Common misconceptions
Some children may think: 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. Some children may think: • 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.

Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Investigate the properties of different materials in order to recommend materials for particularfunctions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat. • Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate. • Investigate rates of dissolving by carrying out comparative and fair test.Separate mixtures by sieving, filtering and evaporation, choosing the most suitable methodand equipment for each mixture. • Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning. • Carry out comparative and fair tests involving non-reversible changes e.g. What affects therate of rusting? What affects the amount of gas produced? • Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) andRuth Benerito (wrinkle free cotton).	• Can create a chart or table grouping/comparing everyday materials by different properties • Can use test evidence gathered about different properties to suggest an appropriate material for a particular purposeCan group solids based on their observations whenmixing them with water • Can give reasons for choice of equipment and methodsto separate a given solution or mixture such as salt or sand in water Can explain the results from their investigations

Lesson 1 **LO: to compare and sort materials according to their properties** https://pstt.org.uk/resources/curriculum-materials/assessment	**Key Assessment Questions** Can children describe a material's properties? Can children explain the uses of different materials based on their properties? Can children sort and compare materials according to their properties?
Lesson 2 **LO: to investigate thermal conductors and insulators**	**Key Assessment Questions** Can children identify materials that are thermal conductors and insulators? Can children explain what thermal conductors and insulators are?

	Can they give reasons for the uses of thermal conductors and insulators?
Lesson 3 **LO: to investigate which electrical conductors make a bulb shine brightest**	**Key Assessment Questions** Can children identify electrical conductors and insulators? Can children explain that some materials are better conductors than others? Can children carry out an investigation to test electrical conductors?
Lesson 4 **LO: to investigate materials which will dissolve**	**Key Assessment Questions** Can children explain/describe dissolving? Can children understand the terms soluble/insoluble/solution? Can children explain the difference between melting and dissolving? Can children identify materials, which dissolve in water? Can children talk about factors, which affect the speed of dissolving?
Lesson 5 **LO: to use different processes to separate mixtures of materials** TAPS science lesson exit cards for separating https://pstt.org.uk/application/files/7114/7021/6048/Y5eg_Materials_Exit_cards_for_separating.pdf	**Key Assessment Questions** Can children identify different ways materials can be mixed together? Do children know which processes to use to separate mixtures?
Lesson 6 **LO: to identify and explain irreversible chemical changes,**	**Key Assessment Questions** Can children identify irreversible chemical changes? Can children explain irreversible changes? Can children describe the new materials created in irreversible chemical changes?
Lesson 7 **To give reasons for the particular uses of everyday materials in relation to their properties**	**Key Assessment Questions** Can children list and explain some of the different properties that materials have? Do children understand that the properties materials have can affect how they are used/what they are used for? Can children explain why a certain material has been chosen for a specific purpose?

If completing topic over a term, objectives can be covered over more than one lesson ensuring scientific enquiry skills (working scientifically) are being developed

Children can plan predict and test then record results in different ways when experimenting