Unit name	Materials
National Curriculum link	• Year 5 Properties and changes of materials
Prior knowledge (EYFS, Key Stage 1)	• Distinguish between an object and the material from which it is made (y1 – everyday materials). • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock (y1 – everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties (y1 – everyday materials). • Identify and compare the suitability of a variety of everyday materials for particular uses (Y2 – uses of everyday materials). • Find out how the shapes of solid objects made from some materials can be changed by bending, squashing, twisting and stretching (y2 – uses of everyday materials).
Upcoming knowledge (Key Stage 3)	• Chemical reactions as the rearrangement of atoms. • Representing chemical reaction using formulae and using equations. • Combustion, thermal decomposition, oxidation and displacement reactions. • Defining acids and alkalis in terms of neutralisation reactions. • The pH scale for measuring acidity/alkalinity; and indicators.
When	• Year B, Spring 1

INTENT (What will be taught)	
Substantive knowledge (Knowledge that…)	• Different materials have different properties; including hardness, transparency, electrical and thermal conductivity and attraction to magnets. • Materials have different uses depending on their properties and their state. • Heat only ever moves from hot to cold and never the other way round. Heat travels better through some materials than others. • Solids and liquids or solids and solids can be mixed together to form a mixture. • Some materials will dissolve in a liquid to form a solution, while others are insoluble and form sediment. • Mixtures can be separated by filtering (insoluble solid and liquid), sieving (two solids) and evaporation (solutions). • Dissolving, mixing and changes of state are reversible changes. This means the mixture / substance can be separated and/or go back to its original form. • Some materials react when you mix them to form a new material. • Changes resulting in the formation of a new material are usually irreversible, for example mixing acids and alkalis. This means that the materials cannot go back to their original form. • A new material can also be formed when exposing a material to fire, air or water. • Burning (combustion) is different to heating and needs a higher temperature, plus fuel and oxygen. This process forms new substances and is irreversible. • Rusting occurs when iron is exposed to oxygen and water. This process forms new substances and this is irreversible.

Vocabulary	Pupils can read, write, spell and define with growing confidence: materials, properties, hard, soft, scratch, bend, transparency, opaque, translucent, transparent, thermal, insulator, conductor, magnetic, non-magnetic, electrical, state of matter, solid, liquid, gas, mixture, dissolve, solution, soluble, insoluble, solute, solvent, filter, sieve, evaporation, condensation, reversible / irreversible change, burning, rusting, comparative test, observation, classify, conclusion, evaluation, reliability
Disciplinary knowledge (Knowledge how…)	• To group and classify materials into a Carroll diagram • To carry out a comparative test, including changes over time, to test for thermal conductivity. • To group and classify materials using a Venn diagram according to solubility • To recover a substance from a solution, using filtering, sieving and evaporation (e.g. to separate salt, sand and water). • To plan and complete a comparative test to identify the best materials for a water filter • To design a fair test to identify the best material for cleaning coins • To use observation and testing to identify an unknown material • To report findings • To draw conclusions from findings • To discuss the reliability of findings and suggest improvements
Common misconceptions (These will be specifically discussed and corrected)	• Confusion between chemical and physical changes / reversible and irreversible changes. • 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.

IMPLEMENTATION (How this will be taught)	
Pedagogy	**At the start of the unit (Lesson 1):** All children will receive a child-friendly version of this document to stick into their science books which will be discussed and explained at the beginning of each unit. The purpose of this is to ensure that they are clear: - What substantive knowledge they will be learning. - What disciplinary knowledge they will be learning. - What vocabulary they will be learning. - What this learning is building on (how it links to previous learning). - What they will go on to learn in the future (how they will build on this learning), including which parts of the unit they will be focusing on depending on whether they are upper or lower key stage 2. We will refer back to this at the beginning of each lesson and throughout the unit so children can see how their learning is progressing. This will replace a specific learning objectives and success criteria for each lesson as the children will be encourage to see their learning as an interwoven, interdependent and spiralled process rather than as separate, linear lessons. Children will complete a self-assessment of their current learning needs and the summative unit assessment to see where they are at the beginning of the unit (The results of which will be shared with the pupils to enable them to take ownership of their learning). (This will be supported where appropriate so that pupil's literacy skills are not a barrier to demonstrating their science knowledge). This information will be used to level teaching correctly throughout the unit and to guide additional support. Children will also have the opportunity to discuss any special interests relevant to the unit. Where time allows, this lesson will finish with a suitable stimulus material for the unit such as a book or video clip, as well as beginning to think about 'Interesting Questions' that we might like to answer as we work through the unit. **Each subsequent lesson:**

	• **Vocabulary:** All lessons will begin with a fifteen minute vocabulary section, involving writing and spelling, discussing and defining the vocabulary for this unit. It is the expectation that this vocabulary be learnt by the end of year 6, but as this unit will be taught twice within KS2, the more complex vocabulary will receive more focus in upper key stage 2. • **Substantive knowledge:** Each lesson will then move onto a fifteen minute discussion-based session, which will include some parts of the unit PowerPoint presentation (either to recap and recall or as new learning), plus a class discussion activity based on a question or visual stimulus such as Explorify activities or the Primary Science Teaching Trust Pictures for Talk, Odd one Out or Big Questions stimulus. All pupils will be expected to contribute using teaching methods based on collaborative learning and methods such as cold questions. • **Disciplinary knowledge:** The lesson will then move onto a 'enquiry' session of approximately forty-five minutes, looking at teaching the disciplinary knowledge in this unit based on the 'I do, we do, you do' principles to encourage pupils to be confident and independent scientists. For this unit, the practical work will focus around the following TAPS focused assessment of science plans: - Exit cards for separating - Solubility Venn diagram - Cleaning coins - Dirty water filter - Forensic powders - Stacking sugar cubes The end of each piece of 'enquiry' work will involve peer assessment and next steps. Where possible, the work will be split into two parts so that there is an opportunity for pupils to act on the feedback they have been given. Pupils will be given time to reflect on their work at the end.

	• **Recall and retention:** Following the principles of cognitive science and the definition of learning as *knowing more and remembering more*, each lesson will finish with a fifteen minute recall and retention activity. This may take the form of a low-stakes quiz (either computer- or paper-based), a mind-mapping or 'drawing' exercise, a story and discussion, or an internet-based activity.
IMPACT (How we will know if teaching has been successful)	
Assessment	• **Formative assessment:** questioning, discussion and observation will be used throughout teaching. Pupils will also be encouraged to identify 'what a good one looks like' prior to beginning a task. • **Evidence:** evidence of learning will be in the form of work in their science exercise books, photographs and videos where appropriate. Vocabulary and recall and retention work will also be recorded in exercise books to allow pupils and teachers to monitor progress and give feedback of how to improve. • **Feedback:** This will be mainly within lessons and verbal due to the nature of science and evidence that feedback is most useful when it is immediate. Pupils may be given written feedback such as next steps where appropriate and useful. In addition, pupils will receive a coloured stamp in their books at the end of each lesson. A red stamp will indicate that they have worked hard and participated well throughout the lesson and that they have made steps forward in their substantive and disciplinary knowledge for this unit. A green stamp will indicate that they have not participated to their full ability and have not provided enough evidence that their knowledge has moved forward. • **Summative assessment:** This will involve a written unit test (this will be supported where appropriate so that pupil's literacy skills are not a barrier to demonstrating their science knowledge). This will be given at the start and end of each unit to assess progress. The TAPS focussed assessment of science used during the 'enquiry' parts of the lessons will also go towards the summative assessment of the unit.

Science levels will be based on all of this evidence and recorded in Pupil Asset. Information will also be passed to the class teacher for use in parents meetings and end of year reports.

- Science levels will be based on all of this evidence and recorded in Pupil Asset. Information will also be passed to the class teacher for use in parents meetings and end of year reports. Working at expected level in Lower KS2 would indicate that a pupil has 40-60% of the required substantive and disciplinary knowledge. For Upper KS2, this would be 50-70%. See table below:

Level:	Lower Key Stage 2 (percentage of substantive and disciplinary knowledge acquired)	Lower Key Stage 2 (percentage of substantive and disciplinary knowledge acquired)
Well below	0-20%	0-30%
Below	21-30%	31-40%
Just below	31%-40%	41%-50%
Expected	41-60%	51-70%
Just above	61%-70%	71%-80%
Above	71-80%	81-90%
Well above	81-100%	91-100+%

- If the summative assessment is over more than one unit, the results of all units would be averaged to give the final level.