Year 1 – Everyday materials

National Curriculum Objectives:

- Distinguish between and object and the material from which it is made.
- Identify and name a variety of everyday materials, including wood, metal, plastic, glass, 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 properties.

Pupils should explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent.

Pupils should explore and experiment with a wide variety of materials, not only those listed in the programme of study, but including for example: brick, paper, fabrics, elastic, foil. Pupils might work scientifically by: performing simple tests to explore questions, for example: 'What is the best material for an umbrella? …for lining a dog basket? …for curtains? …for a bookshelf? …for a gymnast's leotard?

Key Ideas

- There are different materials
- Materials have describable properties.
- Different materials have different properties

Assessment:

- Can they distinguish between an object and the material from which it is made?
- Can they describe materials using their senses, using specific scientific words?
- Can they explain what material objects are made from?
- Can they explain why a material might be useful for a specific job?
- Can they name some different everyday materials? e.g. wood, plastic, metal, water and rock
- Can they sort materials into groups by a given criteria?
- Can they explain how solid shapes can be changed by squashing, bending, twisting and stretching?

	● Can they perform a simple test? ● Can they tell other people about what they have done? ● Can they talk about what they? ● Can they use simple equipment to help them make **Greater Depth** ● Can they describe things that are similar and different between materials? ● Can they explain what happens to certain materials when they are heated, e.g. bread, ice, chocolate? ● Can they explain what happens to certain materials when they are cooled, e.g. jelly, heated chocolate?

Prior Learning	Being Scientists	Vocabulary
In Early Years: ● Children should explore collections of materials with similar and/or different properties	The big idea about materials. ● There are many different materials that have different describable and measurable properties. ● Materials that have similar properties are grouped into metals, rocks, fabrics, wood, plastic and ceramics (including glass). ● The properties of a material determine whether they are suitable for a purpose	Hard, soft, stretchy, stiff, shiny, dull, rough, smooth, bendy/not bendy,

asking questions about the place they live.

- Talk about why things happen and how things work.
- Discuss the things they have observed such as natural and found objects.
- Manipulates materials to achieve a planned effect.

Give a theme for each topic e.g. buildings, exploration, toys, the seaside. Plan to investigate a couple of classes of materials and properties in each topic so children get a depth of experience each topic and cover all the classes of materials over the key stage. E.g.

Topic	Materials	Problems
Buildings	Rocks, wood, ceramics, metals	Which rocks are the least crumbly? ● Which materials absorb the most water? ● Which type of brick would be the easiest to drag to make a pyramid? ● Which material would be the strongest to use as a floor tile?
Toys and nice things	Fabric, plastic, wood, metals	● Which fabric would make the softest blanket? ● The baby has spilt her drink, which material would absorb the drink the best? ● We want to make a really slippery slide, which liquid would be best to use? ● Which chocolate will melt the fastest on a warm plate (a model of a warm hand) ● Which wrapping papers are strong enough to wrap and send a present?
Clothing	Fabric, plastics	●Which material could be used to make a waterproof hat for the teacher when she is on the playground at playtime? ● Which plastic would be flexible enough to make a belt? ● Which material could I wrap my ice egg / snowman in to stop it melting, or would it make it melt quicker? ● What could I wrap a chicken egg in to keep it warm when it is waiting to hatch? ● What could you paint on the runaway gingerbread man that would allow him to swim the river and get away from the fox and not turn to mush?

waterproof/not waterproof, absorbent, opaque,

In 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.
- Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Year 2 – Uses for Everyday Materials

National Curriculum Objectives:

- 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 shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Pupils should identify and discuss the uses of different everyday materials so that they become familiar with how some materials are used for more than one thing (metal can be used for coins, cans, cars and table legs; wood can be used for matches, floors, and telegraph poles) or different materials are used for the same thing (spoons can be made from plastic, wood, metal, but not normally from glass). They should think about the properties of materials that make them suitable or unsuitable for particular purposes and they should be

Key Ideas:

- Materials can be changed by physical force (twisting, bending, squashing and stretching)

Assessment:

- Can they describe the simple physical properties of a variety of everyday materials?

encouraged to think about unusual and creative uses for everyday materials. Pupils might find out about people who have developed useful new materials, for example John Dunlop, Charles Macintosh or John McAdam. Pupils might work scientifically by: comparing the uses of everyday materials in and around the school with materials found in other places (at home, the journey to school, on visits, and in stories, rhymes and songs); observing closely, identifying and classifying the uses of different materials, and recording their observations.	● Can they compare and group together a variety of materials based on their simple physical properties? ● Can they use - see, touch, smell, hear or taste - to help them answer questions? ● Can they use some scientific words to describe what they have seen and measured? <u>Greater Depth</u> ● Can they describe the properties of different materials using words like, transparent or opaque, flexible, etc.? ● Can they sort materials into groups and say why they have sorted them in that way? ● Can they say which materials are natural and which are man-made?

Prior Learning	Being Scientists	Vocabulary
In Year 1: Distinguish between and object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, metal, plastic, glass, 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 properties.	Exploring materials and their properties. • These ideas are explored through testing materials to see if they are appropriate for particular jobs. • Topics need to be arranged so that all the main groups of materials are explored and important properties are investigated (strength, flexibility, waterproofness, absorbency, softness, slippiness, stretchiness, brittleness)	Waterproof, fabric, rubber, cars, macadamisation, rock, paper, cardboard, wood, metal, plastic, glass, brick, twisting, squashing, bending, matches, cans, spoons,

In Year 3:

• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties

• Describe in simple terms how fossils are formed when things that have lived are trapped within rock

• Recognise that soils are made from rocks and organic matter.

Year 3 – Rocks

National Curriculum Objectives

- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
- Describe in simple terms how fossils are formed when things that have lived are trapped within rock
- Recognise that soils are made from rocks and organic matter.

Linked with work in geography, pupils should explore different kinds of rocks and soils, including those in the local environment.

Pupils might work scientifically by: observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time; using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. Pupils might research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. Pupils could explore different soils and identify similarities and differences between them and investigate what happens when rocks are rubbed together or what changes occur when they are in water. They can raise and answer questions about the way soils are formed

Key Ideas:

- Fossils provide evidence that living things have changed over time.

Assessment:

- Can they compare and group together different rocks on the basis of their appearance and simple physical properties?
- Can they describe and explain how different rocks can be useful to us?
- Can they describe in simple terms how fossils are formed when things that have lived are trapped within rock?
- Can they describe and explain the differences between sedimentary and igneous rocks, considering the way they are formed?
- Can they recognise that soils are made from rocks and organic matter?
- Can they describe what they have found using scientific language?
- Can they classify objects in different ways?
- Can they describe what they have found using scientific language?
- Can they use different ideas and suggest how to find something out?

Greater Depth

- Can they classify igneous and sedimentary rocks?

		● Can they begin to relate the properties of rocks with their uses?
Prior Learning	**Being Scientists**	**Vocabulary**
In 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. ● Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. ● May have some understanding of a variety of different rocks in the natural world. ● Some understanding of what soil is. (how to identify soil etc) ● May have some knowledge of what a fossil is.	●Locate Soil and Rock types in school grounds. *(Rock Scavenger Hunt)* ●Soil Detectives *(How are the soils different? What characteristics are the same? Which do you think has best drainage? Which is more likely to lead to flooding? How many soil types have we found? Where might you find more? How might the soil be different in different countries?)* ●What rock is best for a kitchen chopping board? *(What might be the issues with various materials and what they have to withstand? Lots of rock samples, foods such as ketchup, 'vinegar')* ●Make chocolate rocks: Chocolate can be ground into small particles (weathered), heated, cooled, and compressed — just like rocks. Unlike rocks, chocolate can undergo these processes safely and at reasonable temperatures. ●Use your chocolate to create "sedimentary," "metamorphic," and "igneous" chocolate. And at the end of it all, make a tasty treat The Soil Factory *(Why is your recipe the best for effective soil? What would grow best in your soil? Why do you think worms are important to the creation of soil? How can we use composting to make our own soil? Does it currently look like real soil? How long do you think this process will take and why?)* ● Use rocks in school grounds to build a structure. ● *This could be a structure that becomes a permanent fixture within the school grounds and links to a topic* ● *Multiple classes could work on one design over the course of the topic and add to it as they discover new information and facts.* Investigate different fossils. ● Make your own fossils *(How are fossils created? Why do fossils help us find out about historical events? If you could fossilise an object what would it be?)* ● Link to skeletons topic — how do scientists know what dinosaurs looked like.	Rocks, igneous, metamorphic, sedimentary, anthropic, permeable, impermeable, chemical fossil, body fossil, trace fossil, Mary Anning, cast fossil, mould fossil, replacement fossil, extinct, organic matter, top soil, sub soil, base rock.
In Year 4: ● Compare and group materials together, according to whether they are solids, liquids or gases.		

● Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius.

● Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

In Year 6: ● Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years age

Year 4 – States of matter

National Curriculum Objectives:

● Compare and group materials together, according to whether they are solids, liquids or gases.

● Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius.

● Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Pupils might work scientifically by: grouping and classifying a variety of different materials; exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party). They could research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. They might observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting.

Key Ideas:

- Comparing and grouping materials
- That materials change
- The water cycle

Assessment:

● Can they compare and group materials together, according to whether they are solids, liquids or gases?

● Can they explain what happens to materials when they are heated or cooled?

● Can they measure or research the temperature at which different materials change state in degrees Celsius?

● Can they describe how materials change state at different temperatures?

● Can they use measurements to explain changes to the state of water?

● Can they explain everyday phenomena including the water cycle?

● Can they record data using diagrams, labels, classification keys, tables, scatter graphs, bar graphs and line graphs?

● Can they evaluate and communicate their methods and findings?

● Can they use a range scientific equipment to take accurate measurements or readings?

<u>Greater Depth</u>

- Can they group and classify a variety of materials according to the impact of temperature on them?
- Can they explain what happens over time to materials such as puddles on the playground or washing hanging on a line?

Prior Learning	Being Scientists	Vocabulary

In KS1:		
•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. • 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.	• Give children a variety of materials (including powders, gels, foams and things like blu tac) ask them to classify them as solids, liquids or gases. • How does the amount of water added to flour affect its state? • We need to make the best water slide possible. How does the amount of detergent added to water affect how slippery it is? • How does the temperature affect how viscous a liquid is (use cooking oil)? • Put a series of liquids into order of viscosity (choose ones that are similar so they have to perform an accurate test). • Spray perfume or water (children don't know which) at one end of the room and they raise their hands when they can smell it. They then draw diagrams of their choice to show what happened to the smell (gas) and explain the pattern of its movement. • Dancing raisins. Place a handful of raisins in a small bottle of lemonade. Children explore why they behave the way they do. • Place a peach in a glass of lemonade and watch it spin. Why does it behave that way and can you prove it? • Demonstrate the water cycle by melting ice, heating water to let it evaporate, showing the steam condense on a cold surface and letting it run off and drip like rain back into the original container. • Children are shown the following equipment and asked to predict what will happen and why, and then they do it.  • The council put salt on ice and snow to melt it. How does the material sprinkled on ice and snow affect how quickly it melts? • What is the freezing temperature of water? (Mixing ice and salt produces mixtures that can be as cold as -15oC and make good baths for freezing water in). • Does the volume of water affect the temperature at which it freezes? • Chocolate smugglers. Children have been trying to smuggle chocolate into class by putting it in their pockets, but it always ends up as a squidgy, liquid mess. What chocolate would be best to smuggle? *How does the type of chocolate affect its melting temperature?*	Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection

	• Give children a range of substances and ask them to put them in order of what they think their melting temperatures may be. Include metals, rocks, and oils. Can they estimate the melting temperatures? • What is the melting temperature of ice and how does it compare with the freezing temperature of water? • Is the melting temperature of wax the same as its freezing temperature? Investigate. • What do we think will happen to an ice cube if it is left out for a few days? What do we think would happen to a lump of wax and why is there a difference?	

In Year 5:

- 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 wood, metals 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 this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Year 5 Changing Materials

National Curriculum Objectives:

- 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 wood, metals 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 this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4. They should explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.
Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda. They should find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinklefree cotton.

Key Ideas:

- All matter (including gas) has mass. b) Sometimes mixed substances react to make a new substance. These changes are usually irreversible.
- Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible.

Assessment:

- Can they compare and group together everyday materials on the basis of their properties, including hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets?
- Can they explain how some materials dissolve in liquid to form a solution?
- Can they explain what happens when dissolving occurs?
- Can they use their knowledge of solids, liquids and gases to decide and describe how mixtures might be separated, including through filtering, sieving, evaporating?
- Can they give reasons, based on evidence for comparative and fair tests for the particular uses of everyday materials, including metals wood and plastic?
- Can they describe changes using scientific words? (evaporation, condensation) (Covered in Geography unit)
- Can they demonstrate that dissolving, mixing and changes of state are reversible changes? Can they 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?
- Can they use the terms 'reversible' and 'irreversible'?
- Can they plan and carry out a scientific enquiry to answer questions, including recognising and controlling variables where necessary?
- Can they make a prediction with reasons?
- Can they use test results to make predictions to set up comparative and fair tests?
- Can they take repeat readings when appropriate?
- Can they record more complex data and results using scientific diagrams, labels, classification keys, table, scatter graphs, bar and line graphs?

	Greater Depth ● Can they describe methods for separating mixtures? (filtration, distillation) ● Can they work out which materials are most effective for keeping us warm or for keeping something cold? ● Can they use their knowledge of materials to suggest ways to classify? (solids, liquids, gases) ● Can they explore changes that are difficult to reverse, e.g. burning, rusting and reactions such as vinegar with bicarbonate of soda? ● Can they explore the work of chemists who created new materials, e.g. Spencer Silver (glue on sticky notes) or Ruth Benerito (wrinkle free cotton)?

Prior Learning	Being Scientists	Vocabulary
In Year 4: ● Compare and group materials together, according to whether they are solids, liquids or gases. ● Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius. ● Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	"have we made a new substance?" ● Wet clay - air-dried clay - fired clay. ● Flour and water - dough - bread ● Add sugar to fizzy water; it fizzes up. Has a new substance been made? (No, the gas was dissolved in the water and adding sugar made it become un dissolved) ● Add baking powder to vinegar, it fizzes up. Has a new substance been made? (Yes the gas was not in the vinegar as it wasn't fizzy, so it must have been made) ● Add water to instant snow. ● Use lemon juice as an invisible ink, heating gently makes the ink visible. Is this a new substance? ● When water is added to jelly and it is set, is it a new substance	Hardness, Solubility, Transparency, Conductivity, Magnetic, Filter, Evaporation, Dissolving, Mixing Material, conductor, dissolve, insoluble, suspension, chemical, physical, irreversible, solution, reversable, separate, mixture, insulator, transparent, flexible, permeable, soluble, property, magnetic, hard
In KS3: ● the concept of a pure substance ● mixtures, including dissolving ● diffusion in terms of the particle model ● simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography ● the identification of pure substances		