



Progression of Substantive Knowledge in Chemistry

Years R - 6

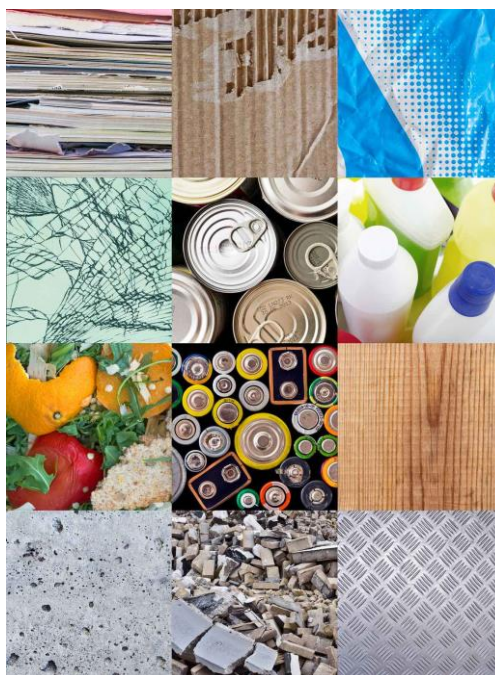
BIOLOGY	CHEMISTRY	PHYSICS
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Understanding the World

EYFS

- *Explore the natural world around them.*
- *Use all their senses in hands-on exploration of natural materials.*
- *Explore collections of materials with similar and/or different properties.*
- *Talk about what they see, using a wide vocabulary.*
- *Talk about the differences between materials and changes they notice.*

Materials



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CHEMISTRY Materials		
	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
Year 1	<u>Describing Materials</u> Knowledge Block 1- The big idea about materials - There are many different materials that have different observable properties - Materials that have similar properties are grouped into metals, rocks, fabrics, wood, plastic and ceramics (including glass).	<u>Year 1 Everyday Materials</u> Pupils should be taught to: - 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.
	<u>Changing Materials</u> Knowledge Block 1- How materials can change - The properties of a material determine whether they are suitable for a purpose. - Materials can be changed by physical force (twisting, bending, squashing and stretching). (The purpose of the activities within this learning journey is for children to understand why we choose certain materials to do certain jobs. Children will plan how to test materials (wood, metal, plastic, glass, brick, paper, rock, cardboard))	<u>Year 2 Uses of everyday materials</u> Pupils should be taught to: - 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

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Year 3	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
	<u>Solids, liquids and gases</u> Knowledge Block 1- Properties of solids, liquids and gases - Materials can be divided into solids, liquids and gases. Solids hold their shape unless forced to change. Liquids flow easily but stay in their container because of gravity. The more viscous a liquid the less runny it is. Gases move everywhere and are not held in containers by gravity. Knowledge Block 2- Changing state Heating causes solids to melt into liquids and liquids to evaporate to gases. Cooling causes gases to condense to liquids and liquids to freeze to solids. Knowledge Block 3- Melting, freezing, boiling and condensation temperatures - Different substances change state at different temperatures but the temperatures at which given substances changes state is always the same. Knowledge Block 4- All about the water cycle - The temperature at which a substance melts from a solid to a liquid is the same at which it freezes from a liquid to a solid. - The temperature at which a substance boils from a liquid to a gas is the same at which it condenses from a gas to a liquid. - Liquids evaporate slowly, even below their boiling temperatures. - The water cycle is the process by which water is continuously transferred between the surface of the earth and the atmosphere. - Liquid water evaporates into water vapor, condenses to form clouds, and precipitates back to earth in the form of rain and snow.	<u>Year 4 States of matter</u> <i>Pupils should be taught to:</i> <i>compare and group materials together, according to whether they are solids, liquids or gases</i> <i>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)</i> <i>identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</i>

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Year 3	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
	<u>Rocks and soils</u> Knowledge Block 1- The different types of rocks - A rock is a solid material made up of minerals forming part of the surface of the Earth - Rocks are exposed on the surface at cliffs, hills and mountains but are also under the surface. - Some rocks, called ores contain metals - Some rocks are made of grains squashed together and can contain the remains of long-dead organisms, called fossils. This type of rock is called sedimentary rock, an example would be limestone, sandstone or mudstone - Some rocks are made of crystals that are locked tightly together. These are called igneous and metamorphic rocks; an example of igneous rock is granite, and an example of metamorphic rock is slate Knowledge Block 2- The properties of rocks - These three types of rocks all have different properties to each other, including porosity, hardness, reaction to chemicals - The properties of the rock depend on how the rock was formed, e.g. Some igneous rocks form from lava from volcanoes and cool very quickly leading to very small crystals Knowledge Block 3- The structure of soils Soil is made up of small broken-down pieces of rock. - Soil contains a range of different size rock pieces, e.g., sand grains or stones. - Soil also contains humus (rotted plant material) - Soil made of very fine rock is called silt or clay.	<u>Year 3 Rocks</u> <i>Pupils should be taught to:</i> <i>compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</i> <i>describe in simple terms how fossils are formed when things that have lived are trapped within rock</i> <i>recognise that soils are made from rocks and organic matter.</i>

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	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
Year 4	<u>Mixtures and separating them</u> Knowledge Block 1- What mixtures are - A substance is an object with the same properties throughout. - A mixture is when more than one substance is present in the same container Knowledge Block 2- What dissolving is - When a substance is added to a liquid the substance can disappear- this is called dissolving - A mixture of a substance that has dissolved in a liquid is called a solution - Not every substance can dissolve in water Knowledge Block 3- Separating mixtures - Mixtures can be separated if the substances have different properties - This is because the substances in the mixture are still present and are unchanged - There are different techniques for separating mixtures. - Filtration requires the substances be one that does not dissolve in a liquid to work. - Sieving requires the substances to be of different sizes to work - Magnets requires the substances to be some magnetic materials and some non-magnet materials to work. - Evaporation requires a solid substance dissolved in water and the solid has a higher boiling point in water to work. - Floating requires some substances to float and some substances to sink to work.	<u>Year 5 Properties and changes of materials</u> Pupils should be taught to: - 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
Year 5	<u>Making new substances</u> Knowledge Block 1: Reversible and irreversible changes - All matter, including gas, has mass. - 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. - Indicators that something new has been made are the properties of the material are different (colour, state, texture, hardness, smell, temperature) - If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change)	<u>Year 5 Properties and changes of materials</u> Pupils should be taught to: - 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.

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Year 6		
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