Hampshire Services
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Hampshire Science Team
Progression of Substantive Knowledge in Chemistry- Materials

Year 1-6

HIAS Science Team
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Overview

This document contains…

A progressive list of the substantive knowledge within the Hampshire Science Learning Journeys with reference to the related National Curriculum statutory requirements.

Points to consider when using this resource

The Learning Journeys provide schools with clearly sequenced substantive knowledge across chemistry, biology and physics. Where possible, the links to the National Curriculum statutory and/or non- statutory requirements have been identified.

Suggested sequence of learning

Year	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
1	Describing materials		Animal survival	Habitats	Seasons	Plants
2	Animal life cycles		Changing materials		Pushes and pulls	Making New Plants
3	Magnets	Animals, Skeletons and Movement	Solids, Liquids and Gases	Plants and their food production	Light	Rocks and soils
4	Mixtures and separating them	Digestion	Plant Reproduction		Making electrical circuits work	Living things
5	Fossils, geological time and classification	Space and gravity	Making new substances		Forces that oppose motion	Circulation
6	How light behaves		Classification and Evolution	Controlling electrical circuits		Sound

BIOLOGY | CHEMISTRY | PHYSICS

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CHEMISTRY
Materials

	Substantive Knowledge from Learning Journeys	*National Curriculum Statutory Requirement*
Year 1	**Describing Materials** **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).	***Year 1 Everyday Materials*** ***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.*
Year 2	**Changing Materials** **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))	***Year 2 Uses of everyday materials*** ***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*
	Solids, liquids and gases **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.	***Year 4 States of matter*** ***Pupils should be taught to:*** • *compare and group materials together, according to whether they are solids, liquids or gases* • *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)* • *identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.*

Year 3	Substantive Knowledge from Learning Journeys	*National Curriculum Statutory Requirement*
	Rocks and soils **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**.	***Year 3 Rocks*** ***Pupils should be taught to:*** • *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.*

	Substantive Knowledge from Learning Journeys	*National Curriculum Statutory Requirement*
Year 4	**Mixtures and separating them** **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.	***Year 5 Properties and changes of materials*** ***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	**Making new substances** **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)	***Year 5 Properties and changes of materials*** ***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.*

Year 6		

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