



## Chemistry Unit: Materials

### What does progression of knowledge look like?

Year	Progression of knowledge.
<b>Nursery</b>	<ul style="list-style-type: none"><li>• Use all their senses in hands-on exploration of natural materials.</li><li>• Explore collections of materials with similar and/or different properties.</li><li>• Talk about the differences between materials and changes they notice.</li></ul>
<b>Reception</b>	<ul style="list-style-type: none"><li>• Use all their senses in hands on exploration of natural materials</li><li>• Explore collections of materials with similar and/or different properties</li><li>• Discuss the differences between materials and changes they notice</li><li>• Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.</li></ul>
<b>1</b> (Everyday materials)	<ul style="list-style-type: none"><li>• Correctly identify and name an object and the material from which it is made.</li><li>• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock.</li><li>• Describe the simple physical properties (see vocabulary appendix for examples) of a variety of everyday materials.</li><li>• Compare a variety of everyday materials on the basis of their simple physical properties.</li><li>• Group together a variety of everyday materials on the basis of their simple physical properties.</li></ul>
<b>2</b> (Uses of everyday materials)	<ul style="list-style-type: none"><li>• Identify what properties a material needs for a particular purpose.</li><li>• Name the materials from which different objects are made.</li><li>• Recognise suitable and unsuitable choices of materials for particular purposes based on physical properties (see vocabulary appendix for examples).</li><li>• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.</li><li>• Know that materials can be either man-made or naturally occurring.</li><li>• Group objects into man-made or natural categories.</li><li>• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.</li></ul>
<b>4</b> (States of matter)	<ul style="list-style-type: none"><li>• Know that all things are made up of particles.</li><li>• Know that particles are arranged differently in solids, liquids and gases.</li><li>• Name properties of solids, liquids and gases.</li><li>• Compare and group materials together according to if they are solids, liquids and gases, giving reasons to justify their choices.</li><li>• Observe that some materials change state when heated or cooled, and are able to give everyday examples of melting and freezing.</li><li>• Understand that melting and freezing are a state change between solids and liquids.</li><li>• Measure or research the temperature at which melting and freezing occurs for some materials.</li><li>• Know that water freezes at 0°C and boils at 100°C.</li><li>• Understand that condensation is a state change from a gas to a liquid.</li><li>• Understand that evaporation is a state change from liquid to gas.</li><li>• Understand that boiling and evaporation are the same state change from liquid to gas but at different temperatures.</li><li>• Know that the speed of evaporation depends on a number of variables including the temperature.</li><li>• Describe the water cycle.</li><li>• Identify the parts played by evaporation and condensation in the water cycle.</li></ul>
<b>5</b> (Properties and changes of materials)	<ul style="list-style-type: none"><li>• 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.</li><li>• Discuss the suitability of everyday materials for different purposes based on their properties, giving reasons, based on evidence from comparative and fair tests.</li><li>• Know the difference between reversible and irreversible changes.</li><li>• Demonstrate that dissolving, mixing and changes of state are reversible changes.</li><li>• Explain that some changes results 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.</li><li>• Understand some materials will dissolve in liquid to form a solution.</li><li>• Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving, and evaporating.</li><li>• Describe how to recover a substance from a solution.</li></ul>
<b>7</b> (The Particle model)	<ul style="list-style-type: none"><li>• Describe how materials are made up of particles.</li><li>• Recognise the particle arrangements for the three states of matter.</li><li>• Represent the particle arrangement of solids, liquids, and gases with a diagram.</li><li>• Describe the features of the states of matter in terms of particles and kinetic energy.</li><li>• Use observations to decide if substances are solids, liquids, or gases.</li><li>• Describe the properties of a substance in its three states.</li></ul>

	<ul style="list-style-type: none"> <li>Use the particle model to explain the properties of each state of matter.</li> <li>Name the changes of state and which state of matter they occur between</li> <li>Use a particle model to describe what occurs during changes of state.</li> <li>Explain changes of state in terms of particle energy and movement.</li> <li>Interpret melting/boiling point data to decide the state of a substance at a given temperature.</li> <li>Investigate the temperature changes that occur during changes of state.</li> <li>Describe what happens to a substance during diffusion in terms of particles.</li> <li>State the factors that affect the rate of diffusion</li> <li>Identify the variables that need to be kept constant when investigating the rate of diffusion.</li> </ul>
<b>7 (Acids and Alkalis)</b>	<ul style="list-style-type: none"> <li>Name common properties of acids and alkalis.</li> <li>Explain what is meant by concentrated and dilute in terms of particles.</li> <li>Describe how the hazard of an acid/alkali changes when it goes from concentrated to dilute.</li> <li>Name a common indicator.</li> <li>Describe the function of an indicator.</li> <li>Classify a substance as acidic/alkaline/neutral from observations with an indicator.</li> <li>Explain how universal indicator and the pH scale measures acidity/alkalinity.</li> <li>Evaluate the use of two different indicators.</li> <li>State what reaction occurs between an acid and an alkali.</li> <li>State the products of a neutralisation reaction.</li> <li>Represent a neutralisation reaction as a word equation.</li> <li>Explain, in terms of pH, what happens during a neutralisation reaction.</li> <li>Describe an everyday example of neutralisation.</li> <li>Name the metal salt produced from the reaction between a known acid and alkali.</li> </ul>
<b>8(Periodic Table)</b>	<ul style="list-style-type: none"> <li>Distinguish between elements and other materials.</li> <li>State the features of an atom.</li> <li>Describe a simple model for an atom.</li> <li>Describe the relationship between elements and atoms.</li> <li>Describe the features of the periodic table, using the key words: metal, non-metal, period, and group.</li> <li>Explain why elements are grouped together in the Periodic Table.</li> <li>Describe some of the ideas that scientists have had to order the elements.</li> <li>Explain why the Periodic Table we used today is based on Mendeleev's Periodic Table.</li> <li>Describe the reactions of group 1 elements with water.</li> <li>Identify patterns in the physical properties of the group 1, 7 and 0 elements.</li> <li>Identify patterns in the chemical properties of the group 1, 7 and 0 elements.</li> <li>Predict the chemical/physical properties of elements using the periodic table.</li> </ul>
<b>8(Metals and Non-Metals)</b>	<ul style="list-style-type: none"> <li>Recall where metals and non-metals are located on the Periodic Table.</li> <li>Describe the properties of metals and non-metals.</li> <li>Classify a substance as being a metal or a non-metal from experimental observations.</li> <li>Describe the test to identify metals.</li> <li>Identify the positive test for several metals.</li> <li>Determine the presence of a metal in an unknown substance from experimental observations.</li> <li>Summarise the reactions of metals as word equations.</li> <li>Compare the reactions of different metals and oxygen.</li> <li>Describe how to test for hydrogen gas.</li> <li>Sort metals in order of how vigorously they react with acid.</li> <li>Determine the name of a metal salt when given the name of the metal and acid that reacted to make it.</li> <li>Sort metals in order of how vigorously they react with oxygen and acid.</li> <li>Define what is meant by a polymer, ceramic, and composite material.</li> <li>Describe the properties of polymers, ceramics, and composites.</li> <li>Identify the advantages and disadvantages of polymers, ceramics, and composites.</li> </ul>
<b>8(Separating Mixtures)</b>	<ul style="list-style-type: none"> <li>Define the key words: solute, solvent, solution, soluble, insoluble, and dissolving.</li> <li>Describe what happens during dissolving, in terms of particles.</li> <li>States factors that affect solubility.</li> <li>Define the key words: filter, filtrate, residue, and filtration.</li> <li>Describe the process of filtration.</li> <li>Explain how filtration separates a mixture of an insoluble solid from a liquid.</li> <li>Apply the use of filters to every-day examples.</li> <li>Describe the process of evaporation as a separation method.</li> <li>Explain how evaporation separates a mixture of a soluble solid from a liquid.</li> <li>Describe the process of distillation.</li> <li>Explain how distillation separates a mixture of two (or more) liquids.</li> </ul>

	<ul style="list-style-type: none"> <li>• Recognise every-day examples of chromatography.</li> <li>• Describe the process of chromatography.</li> <li>• Explain how chromatography separates a mixture of solutes.</li> </ul>
9(Elements)	<ul style="list-style-type: none"> <li>• Use the Periodic Table to find the name/chemical symbol for a given element.</li> <li>• Identify some elements from their chemical symbol.</li> <li>• Explain why chemical symbols are used.</li> <li>• Define the key words: element, compound, and mixture.</li> <li>• Classify familiar substances as an element, compound, or mixture.</li> <li>• Use particle diagrams to illustrate the differences between an element, compound, and mixture.</li> <li>• Distinguish between an element and a compound using chemical formulae.</li> <li>• Identify elements present in a compound from its chemical formulae.</li> <li>• Apply formula naming rules to name unknown compounds.</li> <li>• Represent chemical reactions as word equations.</li> <li>• Write a symbol equation from a word equation using given chemical formulae.</li> <li>• Identify if a symbol equation is balanced.</li> <li>• Define the law of conservation of mass.</li> <li>• Apply the law of conservation of mass to experimental results and observations when making a compound.</li> </ul>
9(Types of Reactions)	<ul style="list-style-type: none"> <li>• Define the terms reactant, product, and chemical reaction.</li> <li>• Explain observations about mass in a chemical or physical change.</li> <li>• Describe the difference between a chemical reaction and a physical change.</li> <li>• Identify whether a change is chemical or physical.</li> <li>• Justify whether a change is chemical or physical using experimental evidence.</li> <li>• Use particle diagrams to show what happens in a reaction.</li> <li>• Describe what occurs during a combustion reaction.</li> <li>• Describe what occurs during a thermal decomposition reaction.</li> <li>• Explain why a reaction is an example of combustion or thermal decomposition.</li> <li>• Predict the products of the combustion or thermal decomposition of a given reactant and show the reaction as a word equation.</li> <li>• Describe what occurs during a displacement reaction.</li> <li>• Recall that metals are ordered from most to least reactive in the reactivity series.</li> <li>• Explain why a displacement reaction occurs.</li> <li>• Use the reactivity series to predict whether a reaction will occur.</li> </ul>
9(Chemical Energy)	<ul style="list-style-type: none"> <li>• Define what is meant by an exothermic and endothermic reaction.</li> <li>• Describe how to identify an exothermic and endothermic reaction.</li> <li>• Use experimental observations to determine if a reaction is exothermic or endothermic.</li> <li>• Relate energy changes in a chemical reaction to breaking and making chemical bonds.</li> <li>• State some every-day uses of exothermic and endothermic reactions.</li> <li>• Determine whether a reaction is exothermic or endothermic using an energy level diagram.</li> <li>• Describe what a catalyst is and its role in a chemical reaction.</li> </ul>