Science & Engineering Education Research and Innovation Hub

MANCHESTER 1824
The University of Manchester

fascinate

Progression in **MATERIALS – PROPERTIES Year 1-9** key for use Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time

Year group	English National Curriculum statement	Child led enquiry opportunities (write as questions)	Maths opportunities	Story opportunities	Resources links	Enquiry type (highlight)	Working scientifically links (highlight)
Year 1	1. distinguish between an object and the material from which it is made 2. identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock 3. describe the simple physical properties of a variety of everyday materials 4. compare and group together a variety of everyday materials on the basis of their simple physical properties.	How can we sort these items? Which materials are attracted to a magnet? Which material would make the best umbrella? Which material would make the best chair?	Sorting hoops	The 3 little pigs Cinderella - shoes		Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	• asking simple questions and recognising that they can be answered in different ways • observing closely, using simple equipment • performing simple tests • identifying and classifying • using their observations and ideas to suggest answers to questions • gathering and recording data to help in answering questions.
Year 2	5. identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses	What would be the best material to build a castle from? Which materials have been used to build our school?	Tables Measurement Venn/ Carroll Diagrams	3 little pigs	Discovery Dog	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	

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Year 3	1. compare and group together different kinds of rocks on the basis of their appearance and simple physical properties	How can we group these different rocks? How are rocks formed? How are fossils formed?	Venn diagrams Scales - hardness?	The Pebble in my pocket Stone Underpants		Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	● asking relevant questions & using different types of scientific enquiries to answer them ● setting up simple practical enquiries, comparative & fair tests ● making systematic and careful observations &, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers & data loggers ● gathering, recording, classifying and presenting data in a variety of ways to help in answering questions ● recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, & tables ● reporting on findings from enquiries, including oral & written explanations, displays or presentations of results & conclusions ● using results to draw simple conclusions, make predictions for new values, suggest improvements & raise further questions
Year 4	2. compare and group materials together, according to whether they are solids, liquids or gases 3. 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. 4. identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	Can you sort these materials into solids, liquids and gases? What is the boiling point of different liquids? What is the melting point of different materials? Which place is the best place to dry the washing?	Measuring reading scales data handling	How to Train your dragon - making armour Itch		Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	

						• identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.
Year 5	1. 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 2. use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating 3. give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic	Which material is the best thermal insulator? How can we separate these mixtures? Which material is the most soluble? How can we make the sugar dissolve faster? Which material would make the best flask? How can we make the water clean?	Measurement and reading scales-thermometers Interpreting scales Data logging Drawing line graphs	Kensuke's Kingdom		Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and

						degree of trust in results, in oral and written forms such as displays and other presentations ● identifying scientific evidence that has been used to support or refute ideas or arguments.
Year 6						
Key Stage 3	**The particulate nature of matter** ● the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure **Atoms, elements & compounds** ● a simple (Dalton) atomic model **Pure and impure substances** ● the concept of a pure substance ● the identification of pure substances.	How would you group the following … (have molymods of different atoms/elements/mixtures) What do we mean by pure? Compare to uses in everyday life - in adverts (i.e. make up wipes) 3 different solutions - which is the most pure? How could you find out?	Interpreting graphs - cooling/heating curves Calculating the relative mass of different elements and compounds percentages and ratios in impure substances	Itch		Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	**Scientific attitudes** ● pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility ● understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review ● evaluate risks. **Experimental skills and investigations** ● ask questions and develop a line of enquiry based on observations of the real world, alongside prior

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	The Periodic Table ● the varying physical and chemical properties of different elements ● the principles underpinning the Mendeleev Periodic Table ● the Periodic Table: periods and groups; metals and non-metals ● how patterns in reactions can be predicted with reference to the Periodic Table ● the properties of metals and non-metals ● the chemical properties of metal and non-metal oxides with respect to acidity. **Materials** ● the order of metals and carbon in the reactivity series ● the use of carbon in obtaining metals from metal oxides ● properties of ceramics, polymers and composites (qualitative).	What tests could you carry out to test whether a material is a metal or non-metal? What pattern is there when metals/non-metals react with oxygen? What patterns are there in the periodic table? How can we use observations from experiments to place the following metals in terms of reactivity? (e.g alkali metals and water) How would you group the following materials? (given selection of ceramics, polymers and composites)	ratios of atoms in a compound melting/boiling point graphs pH values in the pH scale - mixing a pH3 with a pH 11 solution calculating rate of reaction				knowledge and experience ● make predictions using scientific knowledge and understanding ● select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate ● use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety ● make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements ● apply sampling techniques. **Analysis and evaluation** ● apply mathematical concepts and calculate results ● present observations and data using appropriate

| **Earth and atmosphere**
● the composition of the Earth
● the structure of the Earth
● Earth as a source of limited resources and the efficacy of recycling
● the composition of the atmosphere | What is the structure of the Earth?

What resources do we need to live? Where does the resources we need to live come from?

What is the atmosphere? What is it made up of? What is its structure? | Pie charts

Melting and boiling points - what state is a material in | | | | methods, including tables and graphs
● interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions
● present reasoned explanations, including explaining data in relation to predictions and hypotheses
● evaluate data, showing awareness of potential sources of random and systematic error
● identify further questions arising from their results.

Measurement
● understand and use SI units and IUPAC chemical nomenclature
● use and derive simple equations and carry out appropriate calculations
● undertake basic data analysis including simple statistical techniques. |