

Elements, Compounds and reactions

Core Lesson 1	Core Lesson 2	Option lesson 2a	Option lesson 2b	Option lesson 2c	Core Lesson 3	Core Lesson 4
1 - 1 ¼ hours	1 - 1 ¼ hours	30-40 minutes	20-30 minutes + independent study	30 – 40 minutes + independent study time	1-1 ½ hours	1-1 ½ hours
Periodic table	Making new materials	Making a polymer slime	Strengthening a paper clip	Identifying plastics	Manufacturing with chemicals	Atoms and molecules in reactions
<p>Chemistry Objectives Pupils learn the history of the periodic table and about representation of elements by symbols and are introduced to the idea that groups of elements have similar properties</p>	<p>Chemistry Objectives Pupils learn about some of the chemical processes involved in making new materials by making biodiesel from vegetable oil. This is a catalysed decomposition reaction followed by a synthesis reaction.</p>	<p>Chemistry Objectives</p>	<p>Chemistry Objectives</p>	<p>Chemistry Objectives</p>	<p>Chemistry Objectives Pupils use another synthesis reaction involving the heating of solutions to make a useful product, glue, and use a neutralisation reaction to neutralise the residue..</p>	<p>Chemistry Objectives Pupils carry out an experiment to show that the mass of the product when something is burned can be greater than the mass of the original substance. They explain chemical reactions in terms of the rearrangement of the atoms and use the particle rearrangement model to explain why mass is conserved in chemical reactions.</p>
<p>Key concepts and processes Pupils explore historical scientific developments and recognize that the modern periodic table has its roots in a series of observations and ideas by a large number of scientists. They appreciate that today scientists communicate using internationally recognized conventions for grouping of elements and symbols for elements.</p>	<p>Key concepts and processes Pupils understand and control the risks of handling hazardous chemicals. They also consider the applications and implications of science and technology in the benefits and drawbacks of biofuels</p>	<p>Key concepts and processes Pupils make a polymer gel and test its properties, noting that the properties can be altered by changing the 'recipe'. Although polymer chemistry is not studied at KS3, the idea is generally that chemical reactions can be employed to make useful products.</p>	<p>Key concepts and processes Pupils determine the strength of paper clips in an untreated condition, and then compare following heat treatment.</p>	<p>Key concepts and processes Pupils place samples of different plastics into solutions of different (known) densities to determine the identity of the polymer. They relate this to methods used to separate different plastics for recycling.</p>	<p>Key concepts and processes Pupils safely follow procedures and manage risks in carrying out a chemical reaction. They plan and carry out a fair-testing procedure to test the strength of different adhesives.</p>	<p>Key concepts and processes Pupils communicate ideas about reactions using atom diagrams, word equations and chemical symbols. They describe the strengths and limitations of the atom model.</p>
<p>PLTS – Connect their own and others' ideas and experiences in inventive ways, by using observations of properties of lithium and sodium and the ideas of Mendeleev to suggest other elements that would react similarly with water.</p>	<p>PLTS - Anticipate, take and manage risks, by following appropriate safety procedures as they handle chemicals and deciding what steps they should take in managing the risks</p>	<p>PLTS - Try out alternatives or new solutions and follow ideas through by thinking of ways to test the properties of the slime</p>	<p>PLTS - Communicate their learning in relevant ways for different audiences by writing a scientific report for a technical audience</p>	<p>PLTS - Support conclusions using reasoned arguments and evidence, by comparing the data they have recorded with the reference data in order to identify each plastic sample</p>	<p>PLTS - Anticipate, take and manage risks by planning how to experiment safely when heating solutions, by using eye protection and by maintaining correct lab procedures</p>	<p>PLTS - Support conclusions using reasoned arguments, by drawing conclusions that are consistent with the evidence and using their knowledge of particles to explain these</p>
<p>Technician's notes Water trough, lithium, sodium and potassium</p>	<p>Technician's notes Each group will need: goggles, deionised water, 10cm³ rapeseed oil or other vegetable oil (e.g. cooking oil), 1.5cm³ 5% (w/v) potassium hydroxide solution in methanol in a stoppered test tube (see CLEAPSS PS 67-10 for preparation), another test tube, one 10cm³ measuring cylinder, teat pipettes, sample tube and label. A centrifuge may optionally be used.</p>				<p>Technician's notes Engage and explore; different samples of glue (e.g. superglue, paper glue, PVA), eye protection, small pieces of paper and card, wood, metal or plastic, G-glamps, newton meter.. Extend: 250cm³ beakers, 250cm³ conical flask, stirring rods, measuring cylinders, paper towels, scissors, skimmed milk, ethanoic acid (vinegar), sodium hydrogen carbonate (baking soda NaHCO₃), Bunsen burners,</p>	<p>Technician's notes Engage: deflagrating spoons, sulphur powder, gas jars of oxygen, fume cupboard, Bunsen burner, heatproof mat; Lego (different colours and sizes) or Molymod Extend: top-pan balance reading to 0.01 g, pieces of magnesium ribbon about 30 cm in length (0.3g) crucibles and lids, tongs, Bunsen burners, tripods, pipe-clay triangles, heatproof mats Evaluate: copper carbonate, spatula, crucible; effervescent tablet, top-pan balance reading to 0.01 g, plastic drinks bottle with cap</p>

Assessment: During each lesson each student should assess their own level using the pupil speak level ladders and show their partner where the evidence is for that level. They should record this in the grid at the front of the book. The member of staff should then assess the level of a maximum of 2 students work each lesson. At the end of each lesson there will be an end of topic test to check the content level.

Homework: For each topic there is a task booklet that students should use for homework.

Option lesson 4a	Option lesson 4b	Core Lesson 5	Core Lesson 6	Core Lesson 5	Option lesson 5a	Option lesson 5b
30-40 minutes	20-30 minutes + independent study	1 ¼ hours + 40 minutes if packs are made in the next lesson	1 – 1 ½ hours	1 hours	30-40 minutes	20-30 minutes + independent study
Decomposition reactions	Phlogiston and oxygen	Energy transfer in chemical reactions	Writing chemical equations	Reactivity series	Making a simple cell	Problems with reactive metals
Chemistry Objectives	Chemistry Objectives	Chemistry Objectives Pupils learn the difference between exothermic and endothermic reactions, understanding that energy is conserved.	Chemistry Objectives Pupils use the particle model and ideas about rearrangement of atoms to predict the names and formulae of products from given reactants, and write word and symbol equations for these reactions.	Chemistry Objectives Pupils observe reactions of metals with oxygen and water, working out an order of reactivity. They identify whether reactions occur between metals and metal salt solutions, relating their results to the reactivity series	Chemistry Objectives	Chemistry Objectives
Key concepts and processes Pupils heat a metal carbonate so that it decomposes into a metal oxide and carbon dioxide, and use particle diagrams to explain the rearrangement of the atoms in the reaction. They use word equations and possibly chemical symbols to describe the reaction and deduce a pattern in the reactions for thermal decomposition of carbonates.	Key concepts and processes Pupils study the experiments that Antoine Lavoisier performed to refute the phlogiston theory and to provide the evidence for combustion as a reaction with oxygen from the air. They recognise that theories change when they are not supported by evidence and that scientists may question previously held ideas and build on one another's results.	Key concepts and processes Pupils study reactions to select the most useful for making a hot or cold pack	Key concepts and processes Pupils carry out and observe a series of chemical reactions, and describe what is happening in terms of rearrangement of atoms, using balanced symbol equations and /or models	Key concepts and processes Pupils make predictions about the reactions of metals with oxygen, water and metal salts, and observe these to find whether the evidence supports their predictions.	Key concepts and processes Pupils use metals of differing reactivity as the terminals of a simple cell and determine the relative positions of different metals in the reactivity series by comparing the voltage produced by each cell. They appreciate that chemical reactions can release energy, including those in voltaic cells.	Key concepts and processes Pupils apply knowledge of the reactivity series to explain the use of some metals and other coatings as protective layers on other metals.
PLTS - Support conclusions using reasoned arguments, by identifying the compounds created using chemical tests and theoretical models (atom diagrams) to support the conclusions	PLTS - Explore issues, events or problems from different perspectives by evaluating experiments that challenged the phlogiston theory	PLTS – Support conclusions, using reasoned arguments and evidence, by considering how to make the best hot or cold pack	PLTS – Support conclusions, using reasoned arguments and evidence, to show how the particle model helps to explain what happens in a chemical reaction and why matter is conserved.	PLTS – Analyse and evaluate information, judging its relevance and value, by predicting and testing the outcome of reactions of metals with oxygen, water, and metal salts.	PLTS - Identify questions to answer and problems to resolve, by working out the reactivity series from measuring the voltage produced by pairs of metals	PLTS - Communicate their learning in relevant ways for different audiences by explaining, to a family member, why steel cans are sometimes called 'tin' cans
		Technician's notes Engage: glowstick, small piece of potassium, water trough, safety screen Explore: spatulas, test tubes, test tube racks, 10cm ³ measuring cylinders, 2M NaOH, 2M HCl, 1M H ₂ SO ₄ , 0.5M NaHCO ₃ , citric acid, CuSO solution, magnesium powder, 20 vol H ₂ O ₂ , a potato, calcium chloride, baking soda, Epsom salts, baking soda, vinegar, temperature sensors and data loggers	Technician's notes Engage: top pan balance, 0.5g of magnesium ribbon, crucible and lid, tongs, Bunsen burner, tripod, triangle and heatproof mat. Extend: magnesium ribbon, copper sulphate solution, zinc metal, 0.5M HCl, molymod kit, modeling clay, sticks	Technician's notes Engage: sodium, lithium, scapel, white tile, copper and zinc strips Explore: copper, zinc, magnesium and calcium Explain: water trough, lithium, sodium, potassium, litmus indicator, safety screen Extend: 0.1M to 0.4M solutions of CuSO₄, iron sulphate, zinc sulphate and magnesium sulphate, strips of Cu, Zn, Mg and Fe	Technician's notes	Technician's notes
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Core lesson 6

1 - 1 ½ hour

Patterns in reactions with acids

Chemistry Objectives

Pupils consider the reaction patterns for metals with acids producing the metal salt and hydrogen, describing them with word and symbol equations

Key concepts and processes

Pupils understand that using qualitative methods to determine the order of reactivity of metals is crude. They identify variables and outcomes and design an enquiry that will provide quantitative data, evidence to test their predictions and a reactivity order for metals.

PLTS – Generate ideas and explore possibilities, by designing an enquiry to obtain quantitative data for reactions of metals and acids.

Technician's notes

Explore: 2M HCl, small strips of magnesium ribbon, splints

Extend: 1M H₂SO₄, 2M HCl, small pieces of Cu, Fe, Zn, Mg, Al conical flasks with bungs fitted, delivery tubes, test tubes, measuring cylinders, top-pan balance, thermometers or temperature sensors

Assessment: During each lesson each student should assess their own level using the pupil speak level ladders and show their partner where the evidence is for that level. They should record this in the grid at the front of the book. The member of staff should then assess the level of a maximum of 2 students work each lesson. At the end of each lesson there will be an end of topic test to check the content level.

Homework: For each topic there is a task booklet that students should use for homework.