The Sutton Academy

Knowledge Rich Curriculum Plan

SCIENCE- Chemistry Year 11

Lesson/Learning Sequence	Intended Knowledge: *Students will know that…*	Prior Knowledge: *In order to know this, students need to already know that…*	Working Scientifically	Tiered Vocabulary and Reading Activity	Assessment	Support
Lesson: Pure Substances	• Students will know that a pure substance is a single element or compound that isn't mixed with any other substance • Students will know that pure elements and compounds melt and boil at specific temperatures	• ***Students need to already know that an element is made up of only one type of atom*** • ***Students need to already know that a compound is made from two or more different atoms chemically bonded together***	*Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.*	*Tier 2* *Specific: clearly defined* *Tier 3*	*What information about a substance can we use to identify if a substance is pure.*	*BBC bitesize* *Tassomai* *Kay Science* *Knowledge organisers*

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	• Students will know that melting and boiling point data can be used to distinguish pure substances from mixtures • Students will know that the definition of pure in everyday language is different to the definition used in chemistry Students will know how to use melting and boiling point data to distinguish pure from impure substances	***Students need to already know that the melting point is the temperature a substance melts at, and the boiling point is the temperature a substance boils at***	*Use scientific vocabulary, terminology and definitions.*	*Pure: a single element or compound that isn't mixed with any other substance*	*Why might the label PURE orange juice not be scientifically accurate?*	
Lesson: Formulations	• Students will know that a formulation is a mixture that has been designed as a useful product • Students will know that there are many products that are complex mixtures in which each chemical has a particular purpose • Students will know that formulations are made by mixing the components in carefully measured quantities to ensure that the product has the required properties. • Students will know that examples of formulations include fuels, cleaning agents, paints, medicines, alloys, fertilisers and foods Students will know how to identify formulations given appropriate information	***Students need to already know that mixtures contain 2 or more different substances not bonded together.***	*Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.* *Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.*	*Tier 2* *Complex: consisting of many different parts* *Tier 3* *Formulation: a mixture that has been designed as a useful product* *Fertiliser: a chemical or natural substance that is added to soil to aid the growth of plants.*	*Why are formulation useful?* *Explain the difference between pure substances and formulations*	*BBC bitesize* *Tassomai* *Kay Science* *Knowledge organisers*
Lesson: Chromatography	• Students will know that chromatography can be used to give information to help identify substances • Students will know that chromatography involves a stationary phase and mobile phase. • Students will know that the separation of the substance by chromatography depends on the	• ***Students need to already know that chromatography is used to separate mixtures*** ***Students need to already know how to express numbers to an appropriate number of significant figures.***	*Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.*	*Tier 2* *Interaction: action or influence acting between objects/ substances/ organisms* *Tier 3*	*Explain how chromatography can be used to separate a mixture* *Why does the line at the bottom of the chromatogram*	*BBC bitesize* *Tassomai* *Kay Science* *Knowledge organisers*

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	distribution of substances between the phases • Students will know that the Rf value is used to identify substances, and can be calculated using: • Rf = distance moved by sample ÷ distance moved by solvent • Students will know that compounds in a mixture may separate into different spots depending on the solvent but a pure compound will produce a single spot in all solvents • Students will know how to explain how chromatography separates mixtures • Students will know how to interpret chromatograms and determine Rf values Students will know how to practically carry out paper chromatography			*Stationary Phase: the phase of chromatography that doesn't move* *Mobile phase: the phase of chromatography that moves*	*have to be drawn in pencil?* *Why might it be difficult to calculate the Rf value from our chromatograms*	
Lesson: Testing for Gases	• Students will know that to test for hydrogen a lit splint is used, and the positive result would be a squeaky pop • Students will know that to test for oxygen a glowing splint is used, and a positive result would be the splint relighting • Students will know that to test for carbon dioxide the gas is bubbled through limewater, and a positive result would be the limewater turning cloudy • Students will know that to test for chlorine water damp litmus paper is held above the gas, which bleaches for a positive result	• ***Students need to already know that chemical reactions can produce gas.*** ***Students need to already know that hydrogen, oxygen, carbon dioxide and chlorine are all examples of gases.***	*Making accurate observations* *Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.*	*Tier 2* *Bleaching: removing colour* *Tier 3*	*A student is provided with a sample of a gas and asked to identify it. He knows that the gas is either chlorine, oxygen, carbon dioxide or hydrogen. Describe how the student should analyse the gas in order to identify it.*	*BBC bitesize* *Tassomai* *Kay Science* *Knowledge organisers*

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Lesson: Flame Tests (triple only)	• Students will know that flame tests can be used to identify some metal ions. • Students will know the following results from flame tests: -Lithium compounds result in crimson flames -Sodium compounds result in yellow flames -Potassium compounds result in lilac flames -Calcium compounds result in orange-red flames -Copper compounds result in green flames • Students will know that if a sample contains a mixture of ions some flame colours can be masked Students will know how to identify compounds through flame tests that are carried out	***Students need to already know that most ionic compounds contain metal ions***	*Making accurate observations* *Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.*		*How might a student safely carry out a flame test to determine the metal in a compound?* *A student carried out a flame test to identify the metal found in a compound, they observed a* *_____* *flame, what metal is present in the compound?*	*BBC bitesize* *Tassomai* *Kay Science* *Knowledge organisers*
Lesson: Metal Hydroxides (Triple only)	• Students will know that sodium hydroxide solution can be used to identify some metal ions (in solution) • Students will know that solutions of aluminium, calcium and magnesium ions form white precipitates when sodium hydroxide solution is added • Students will know that aluminium hydroxide precipitate dissolves in excess sodium hydroxide solution • Students will know that solutions that contain copper (II) ions form a blue precipitate when sodium hydroxide solution is added • Students will know that solutions containing iron (II) ions form a green precipitate when mixed with sodium hydroxide solution	• ***Students need to already know how to write ionic equations*** ***Students need to already know that a precipitate is an insoluble compound formed during a chemical reaction***	*Making accurate observations* *Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.*	*Tier 2* *Tier 3* *Precipitate: a solid that forms when two solutions mix to form an insoluble product*	*From a chemical equation, how might you determine what product has formed the precipitate?* *-Its state symbol will be (s)* *How might you distinguish between solutions of aluminium hydroxide and magnesium hydroxide?* *-Add a few drops of sodium hydroxide. They*	*BBC bitesize* *Tassomai* *Kay Science* *Knowledge organisers*

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	• Students will know that solutions containing iron (III) ions will form a brown precipitate when sodium hydroxide solution is added. Students will know how to write balanced symbol and ionic equations for the reactions to produce the insoluble hydroxides				*will both then produce white precipitates. Then add excess sodium hydroxide, the aluminium hydroxide precipitate will re-dissolve however the magnesium hydroxide precipitate will remain.*	
Lesson: Tests for negative ions (Triple only)	• Students will know that carbonates react with dilute acids to form carbon dioxide, and the carbon dioxide can be identified with limewater • Students will know that halide ions in solution form precipitates with silver nitrate solution in the presence of dilute nitric acid. • Students will know that silver chloride is white, silver bromide is cream and silver iodide is yellow. • Students will know that sulfate ions in solution produce a white precipitate with barium chloride solution in the presence of dilute hydrochloric acid. Students will know how to use chemical tests and flame tests to identify the ions in unknown single ionic compounds.	• ***Students need to already know that carbon dioxide is tested by bubbling through limewater, turning the limewater cloudy*** ***Students need to already know that carbonates, halides and sulfates are negative ions***	*Making accurate observations* *Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.*	*Ion – an atom that has lost or gained electrons*		*BBC bitesize* *Tassomai* *Kay Science* *Knowledge organisers*
Lesson: Instrumental Methods (Triple only)	• Students will know that elements and compounds can be detected and identified using instrumental methods. • Students will know that instrumental methods are accurate, sensitive and rapid.	*Students will be aware of flame test being used to identify the metal ions. Students are aware that there are various methods of identification.*	*Interpreting data* *Understand how scientific methods and theories develop over time.*	*Tier 2* *Instrumental: using a measuring device* *Tier 3*		*BBC bitesize* *Tassomai* *Kay Science* *Knowledge organisers*

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	• Students will know how to compare the effectiveness of chemical tests and instrumental methods • Students will know that flame emission spectroscopy is an example of an instrumental method used to analyse metal ions in solutions • Students will know that flame emission spectroscopy is carried out by putting the sample into a flame and the light given out is passed through a spectroscope. • Students will know that the output of flame emission spectroscopy is a line spectrum that can be analysed to identify the metal ions in the solution and measure their concentrations. Students will know how to interpret results given appropriate data in chart or tabular form.			*Spectroscopy: measuring spectra of a sample that emits electromagnetic waves.*		