

Spec ref.	Summary of the specification content	Learning outcomes <i>What most candidates should be able to do</i>	Suggested timing (hours)	Opportunities to develop Scientific Communication skills	Opportunities to develop and apply practical and enquiry skills	Self/peer assessment opportunities and resources <i>Reference to past questions that indicate success</i>	Key pieces of assessed work
4.8.3.1	<p>Flame tests can be used to identify some metal ions (cations). Lithium, sodium, potassium, calcium and copper compounds produce distinctive colours in flame tests:</p> <ul style="list-style-type: none"> • lithium compounds result in a crimson flame • sodium compounds result in a yellow flame • potassium compounds result in a lilac flame 	<p>Identify species from the results of the tests in 8.3a to 8.3e.</p> <p><i>Flame colours of other metal ions are not required knowledge.</i></p> <p>WS 2.2</p>	1	<p>Describe the flame tests for identifying cations to another student.</p> <p>Research how firework manufacturers produce the different colours in fireworks.</p>	<p>Carry out flame tests on the following cations:</p> <ul style="list-style-type: none"> • lithium • sodium • potassium • calcium • copper. <p>AT 8</p>	<p>Video clip YouTube: Testing for positive ions – Part 1</p>	

	<ul style="list-style-type: none"> • calcium compounds result in an orange-red flame • copper compounds result in a green flame. <p>If a sample containing a mixture of ions is used, some flame colours can be masked.</p>						
4.8.3.2	<p>Sodium hydroxide solution can be used to identify some metal ions (cations).</p> <p>Solutions of aluminium, calcium and magnesium ions form white precipitates when sodium hydroxide solution is added but only the aluminium hydroxide precipitate dissolves in</p>	<p>Be able to write balanced equations for the reactions to produce the insoluble hydroxides.</p> <p><i>Students are not expected to write equations for the production of sodium aluminate.</i></p> <p>WS 2.2</p>	2	Describe how sodium hydroxide can be used to identify some cations to another student.	Use sodium hydroxide to test for the following cations: <ul style="list-style-type: none"> • aluminium • calcium • magnesium • copper(II) • iron(II) • iron(III). AT8		

	<p>excess sodium hydroxide solution.</p> <p>Solutions of copper(II), iron(II) and iron(III) ions form coloured precipitates when sodium hydroxide solution is added. Copper(II) forms a blue precipitate, iron(II) a green precipitate and iron(III) a brown precipitate.</p>						
4.8.3.3	<p>Carbonates react with dilute acids to form carbon dioxide gas. Carbon dioxide can be identified with limewater.</p>		1	Describe how dilute acids can be used to identify carbonates to another student.	<p>Use dilute acid to test for the following carbonates:</p> <ul style="list-style-type: none"> • sodium carbonate • potassium carbonate. <p>Analyse the composition of an egg shell, testing for the presence of various ions using acids and other test tube reactions and flame tests.</p>	<p>Video clip: YouTube: Sulfate and Carbonate Tests</p>	

4.8.3.4	Halide ions in solution produce precipitates with silver nitrate solution in the presence of dilute nitric acid. Silver chloride is white, silver bromide is cream and silver iodide is yellow.		1	Describe how silver nitrate can be used to identify halides to another student.	Use silver nitrate to test the following halides: <ul style="list-style-type: none"> • chloride • bromide • iodide. 	Video clip: YouTube: Halide ion tests	
4.8.3.4	Halide ions in solution produce precipitates with silver nitrate solution in the presence of dilute nitric acid. Silver chloride is white, silver bromide is cream and silver iodide is yellow.		1	Describe how silver nitrate can be used to identify halides to another student.	Use silver nitrate to test the following halides: <ul style="list-style-type: none"> • chloride • bromide • iodide. 	Video clip: YouTube: Halide ion tests	
4.8.3.6	Elements and compounds can be detected and identified using instrumental methods. Instrumental methods are accurate, sensitive and rapid.	State advantages of instrumental methods compared with the chemical tests in this specification. WS 1.4	0.5		Research instrumental methods for detecting elements and compounds. Compare these to chemical tests carried out in this specification. Suggest advantages of the instrumental methods compared		

					with the chemical tests.		
4.8.3.7	Flame emission spectroscopy is an example of an instrumental method used to analyse metal ions in solutions. The sample is put into a flame and the light given out is passed through a spectroscope. The output is a line spectrum that can be analysed to identify the metal ions in the solution and measure their concentrations.	Interpret an instrumental result given appropriate data in chart or tabular form, when accompanied by a reference set in the same form, limited to flame emission spectroscopy. WS 3.6 MS 4a	1	Describe the process of flame emission spectroscopy. Explain what happens to a sample throughout the process of flame emission spectroscopy. Interpret instrumental results for flame emission spectroscopy. Research how chemical analysis has been used to detect and solve crimes especially in forgery and murder by poisoning. Research how robotic spacecraft sent to investigate other planets analyse their atmospheres and surface materials using instrumentation. Discuss the advantages and disadvantages of	Research how flame emission spectroscopy takes place. An opportunity to observe flame spectra using a hand-held spectroscope. AT 8	Video clip YouTube: Atomic Emission Spectroscopy	Past paper question 1 specimen paper 2 set 2 Past paper question 7 specimen paper 2 set 1 EXAM

				instrumental analysis versus test tube analysis.			
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