

1.1	yellow	allow orange allow orange-yellow	1	AO1 4.8.3.1
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1.2	copper (ion)	allow Cu^{2+} allow copper (II) allow barium (ion) allow Ba^{2+}	1	AO1 4.8.3.1
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1.3	(flame) colours are masked	allow (flame) colours mix / blend allow only see one colour allow cannot see two colours at once ignore hard to distinguish	1	AO1 4.8.3.1
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1.4	Li ⁺		1	AO2
	Na ⁺		1	4.8.3.7

1.5	bromide (ion)	allow Br ⁻ ignore bromine	1	AO1 4.8.3.4
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1.6	add barium chloride (solution)	allow barium nitrate (solution)	1	AO1 4.8.3.5
	add hydrochloric acid	allow nitric acid allow acidified do not accept sulfuric acid	1	
	white precipitate produced	dependent on use of a barium compound	1	

2.1	Level 3: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.8.2.3 4.8.3.1 4.8.3.3
	Level 2: The design/plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content lithium: • crush tablets or dissolve tablet (in water or acid) • clean wire • place on wire • place in (roaring / blue / non-luminous) flame • observe flame colour • crimson flame carbonate: • add hydrochloric acid • effervescence / fizzing • bubble gas through limewater • limewater becomes cloudy		

3.1	add sodium hydroxide (solution to water sample)	dependent on correct test in MP1	1	AO1 4.8.3.2
	white precipitate (forms)		1	
	(precipitate which is) soluble in excess (NaOH)		1	

3.2	add barium chloride (solution) and (dilute) hydrochloric acid (to water sample)	allow barium nitrate (solution) allow (dilute) nitric acid	1	AO1 4.8.3.5
	white precipitate (forms)	dependent on addition of barium chloride / nitrate (solution) in MP1	1	

4.1	green	allow blue-green	1	AO1 4.8.3.1 RPA 7
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4.2	did not clean the metal wire (between tests) or copper sulfate (solution) is still present	1	AO3 4.8.3.1 RPA 7
	(so) colours are mixed / blended / masked	1	

4.3	(copper sulfate solution) blue precipitate	allow blue solid	1	AO1 4.8.3.2 RPA 7
	(calcium iodide solution) white precipitate	allow white solid	1	

4.4	barium chloride (solution)	allow barium nitrate (solution)	1	AO1 4.8.3.5 RPA 7
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4.5	silver nitrate (solution)		1	AO1 4.8.3.4 RPA 7
	yellow precipitate	allow yellow solid allow pale yellow precipitate / solid	1	

5.1	flame test	allow description of flame test	1	AO1 4.8.3.1 RPA7
	lilac (flame)		1	

5.2	flame emission spectroscopy		1	AO1 4.8.3.6 4.8.3.7
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5.3	white precipitate	ignore precipitate dissolves	1	AO1 4.8.3.2 RPA7
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5.4	(add) excess sodium hydroxide (solution)	allow (add) more sodium hydroxide (solution)	1	AO3
	precipitate dissolves		1	AO1 4.8.3.2 RPA7

5.5	add barium chloride (solution)	allow add barium nitrate (solution)	1	AO1 4.8.3.5 RPA7
	add (dilute) hydrochloric acid	allow add (dilute) nitric acid	1	
	white precipitate	dependent on MP1 being awarded	1	

6.1	sodium hydroxide (solution)	MP2 dependent on MP1 allow NaOH for sodium hydroxide	1	AO1 4.8.3.2 RPA7
	blue precipitate	allow blue solid	1	

6.2	(add acidified) barium chloride (solution)	MP2 dependent on MP1 allow BaCl_2 for barium chloride allow (add acidified) barium nitrate (solution) do not accept add sulfuric acid	1	AO1 4.8.3.5 RPA7
	white precipitate	allow white solid	1	

7.1	Level 3: The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 4.8.3.1 4.8.3.4 RPA7
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content (potassium ions) • place sample on (clean metal) wire • introduce into (blue / non-luminous) flame • using (Bunsen) burner • observe lilac flame colour • which shows presence of potassium (ions) (bromide ions) • dissolve sample • in (distilled) water • in test tube • add (dilute) nitric acid • add silver nitrate (solution) • using (dropping) pipette • observe cream precipitate (formed after addition of silver nitrate solution) • which shows presence of bromide (ions)		

7.2	flame emission spectroscopy		1	AO1 4.8.3.7
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7.3	any one from: • (more) accurate • (more) sensitive • fast(er) • determine the concentration of ions present	allow requires a small(er) sample	1	AO1 4.8.3.6
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8.1		MP2 is dependent upon MP1 being awarded		AO1 4.8.3.2 RPA7
	(test) (add) sodium hydroxide (solution)		1	
	(result) blue precipitate		1	
	OR			
	(test) flame test (1)			
	(result) green (flame) (1)	allow blue-green (flame)		