

# MARK SCHEME

# GCSE

## CHEMISTRY

## AQA - TRIPLE SCIENCE

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C8 - TEST 5

CHEMICAL ANALYSIS

Advanced

## Mark schemes

1.

Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

### 0 marks

No relevant content

### Level 1 (1 – 2 marks)

Any description of a method used and / or a result given

### Level 2 (3 – 4 marks)

Description of workable methods used, with results to identify positive **or** negative ions

### Level 3 (5 – 6 marks)

Description of methods used to identify both positive **and** negative ions, with relevant results

### examples of the points made in the response

#### *extra information*

**Test:** add (platinum / nichrome) wire (for the flame test)

*accept any method of introducing the solution into the flame, eg a splint soaked in the solution or sprayed from a bottle*

**Result:** the sodium compounds result in a yellow / orange / gold flame **or** the potassium compound results in a lilac / purple / mauve flame

*student could state that potassium carbonate gives a different colour to the three sodium compounds as long as it is clear that the flame test colour comes from Na<sup>+</sup> or K<sup>+</sup>*

**Test:** add dilute nitric acid to all four solutions

*allow any acid*

**Result:** sodium carbonate and potassium carbonate will effervesce **or** sodium chloride and sodium iodide will not effervesce

**Test:** add dilute nitric acid followed by silver nitrate

**Result:** sodium chloride and sodium iodide produce a precipitate **or** sodium chloride produces a white precipitate and sodium iodide produces a yellow precipitate

*accept sodium carbonate and potassium carbonate do not produce a precipitate*

[6]

<b>2.</b>	(a) lithium	1
	<i>allow Li<sup>+</sup> / Li</i>	
	yellow	1
	<i>allow orange</i>	
	(b) silver nitrate (solution)	
	<i>incorrect test = 0 marks</i>	
	<i>ignore (nitric) acid</i>	
	<i>do <b>not</b> allow other named acids</i>	1
	white precipitate	1
	(c) blue precipitate (with sodium hydroxide) indicates copper ions	
	<i>allow Cu<sup>2+</sup></i>	1
	and white precipitate (with barium chloride) indicates sulfate ions	
	<i>allow SO<sub>4</sub><sup>2-</sup></i>	
	<i>accept compound X is copper sulfate / CuSO<sub>4</sub> for 1 mark</i>	1
	but iron(II) ions produce a green precipitate (with sodium hydroxide)	1
		<b>[7]</b>
<b>3.</b>	(a) start line drawn in ink	
	<i>allow start line should have been drawn in pencil</i>	1
	(so) ink dissolves	
	<i>(as) pencil does not dissolve</i>	
	<b>or</b>	
	ink runs in solvent / water	
	<b>or</b>	
	<i>pencil does not run in solvent / water</i>	1
	water used (as solvent)	
	<i>allow ethanol not used</i>	
	<b>or</b>	
	water in beaker	1
	(so) colours will not dissolve / move	1

- (b) any **two** from:
- the flowers have no colours in common  
*allow the flowers are not the same colour*
  - A / B contain one colour
  - C contains two colours  
*allow C is a mixture of colours*
  - (the colour in) B is most soluble  
*allow (the colour in) B has the highest  $R_f$  value*  
*allow one of the colours in C is the least soluble*

2

(c) (distance moved) =  $\frac{3.2}{0.65}$

1

(distance moved) = 4.9 (cm)

*allow 4.923076923 (cm) correctly rounded*

1

*an answer of 4.9 (cm) scores 2 marks*

[8]

4.

- (a) **X:**  
 $\text{Fe}^{2+}$  / iron(II),  $\text{SO}_4^{2-}$  / sulfate  
*allow iron(II) sulfate*  
**or**  $\text{FeSO}_4$

1

- Y:**  
 $\text{Na}^+$  / sodium,  $\text{I}^-$  / iodide  
*allow sodium iodide*  
**or**  $\text{NaI}$

1

- Z:**  
 $\text{Fe}^{3+}$  / iron(III),  $\text{Br}^-$  / bromide  
*allow iron(III) bromide*  
**or**  $\text{FeBr}_3$   
*correct identification of any two ions = one mark*  
*correct identification of any four ions = two marks*

1

(b) any **five** from:

*allow converse arguments*

method 1

- weighing is accurate
- not all barium sulfate may be precipitated
- precipitate may be lost
- precipitate may not be dry
- takes longer
- requires energy

*allow not all the barium hydroxide has reacted*

method 2

- accurate
- works for low concentrations

*allow reliable / precise*

5

[8]

5.

(a) (i) (bubble gas produced through) limewater

*incorrect tests = zero*

1

(limewater) goes cloudy / milky

1

(ii) *ignore yes or no*

red flame indicates that calcium / lithium ions present

*allow aluminium has no flame colour*

**or**

Ca/Mg also produce a (white) precipitate with NaOH

1

the (white) precipitate formed in test 3 **or** by adding sodium hydroxide solution would dissolve (in excess) if aluminium ions were present

1

(iii) *ignore yes or no*

because a white precipitate is formed in test 4 **or** by adding silver nitrate

1

but chloride ions are in hydrochloric acid

1

(b) (i) mass spectrometry  
*allow MS*

**or**

atomic absorption spectroscopy

*allow AAS*

*spectrometry / spectroscopy alone is insufficient*

1

(ii) can detect a small(er) amount of the substance

*allow can detect small(er) changes*

*allow small(er) sample sizes*

*ignore references to precision / accuracy*

1

**[8]**

**6.**

(a) (i)  $\text{Na}_2\text{CO}_3$ :  $\text{HCl} \rightarrow$  gas / effervescence / bubbles (1)  
 $\text{CO}_2$  / carbon dioxide / turns lime water milky (1)

1

$\text{NaCl}$ :  $\text{AgNO}_3 \rightarrow$  white ppt (1)  
silver chloride (1)

1

$\text{NaNO}_3$ :  $\text{Al} + \text{NaOH} \rightarrow$  pungent / sharp smell / choking gas (1)  
 $\text{NH}_3$  / ammonia / turns (red) litmus blue(1)

1

$\text{Na}_2\text{SO}_4$ :  $\text{BaCl}_2 \rightarrow$  white ppt (1)  
barium sulfate (1)

1

*each correct test and one result = 1 mark*

**one other result for any test = 1 mark this mark can only be awarded once**

(ii) all would give a yellow / yellow-orange (flame) / same coloured (flame) / same results

*allow orange (flame) 1*

**or**

they all contain sodium

1

(b) any **two** from:

*ignore cost/errors*

- fast / quick or comment about speed  
*allow precise*
- small amounts/sensitive  
*allow can be left to run/continuous analysis*
- accurate
- ease of automation  
*accept operators do not need chemical skills*
- sample not used up
- reliable / efficient

2

[7]

7.

(a) (i) place sample in flame

*accept flame test*

*accept any workable method*

*allow burn*

*ignore heat*

1

sodium: yellow (flame)

*allow orange*

1

potassium: lilac (flame)

*allow purple*

1

(ii) (lilac) colour (of potassium) obscured by (yellow) colour of sodium

allow difficult to see two colours

*allow sodium colour is brighter*

*allow colours mix*

1

(b) acidify (with nitric acid)

*do **not** accept if acidified with anything other than nitric acid*

1

add silver nitrate (solution)

1

white precipitate

*depends on second marking point*

*allow white solid*

*ignore silver chloride*

*ignore solution goes cloudy / milky*

1

(c) (i) add excess (sodium hydroxide)

*allow add sodium hydroxide*

1

aluminium (ions / hydroxide) (re)dissolve

*depends on first marking point*

*allow if aluminium, (white) precipitate / solid dissolves*

*allow magnesium (ions / hydroxide) do not (re)dissolve*

1

(ii) place sample in flame

*accept flame test*

*accept any workable method*

*allow burn*

*ignore heat*

1

flame does not go red

*accept calcium (ions / hydroxide would produce) red flame*

*allow magnesium (ions / hydroxide) (produce) no flame colour*

1

[11]