



# **GCSE Chemistry**

## **Identification of Ions**

### **Mark Scheme**

**Time available: 65 minutes**

**Marks available: 63 marks**

**[www.accesstuition.com](http://www.accesstuition.com)**

## Mark schemes

<b>1.</b>	(a) yellow	<i>allow orange</i> <i>allow orange-yellow</i>	1
	(b) copper (ion)	<i>allow Cu<sup>2+</sup></i> <i>allow copper (II)</i> <i>allow barium (ion)</i> <i>allow Ba<sup>2+</sup></i>	1
	(c) (flame) colours are masked	<i>allow (flame) colours mix / blend</i> <i>allow only see one colour</i> <i>allow cannot see two colours at once</i> <i>ignore hard to distinguish</i>	1
	(d) Li <sup>+</sup>		1
	Na <sup>+</sup>		1
	(e) bromide (ion)	<i>allow Br<sup>-</sup></i> <i>ignore bromine</i>	1
	(f) add barium chloride (solution)	<i>allow barium nitrate (solution)</i>	1
	add hydrochloric acid	<i>allow nitric acid</i> <i>allow acidified</i> <i>do <b>not</b> accept sulfuric acid</i>	1
	white precipitate produced	<i>dependent on use of a barium compound</i>	1
			<b>[9]</b>

1

**2.** (a)  $\frac{125}{8}$

= 15.6(25) (g)

*an answer of 15.6(25) (g) scores 2 marks*

1

(b) copper (ions)

*allow in either order*

1

sulfate (ions)

1

(c) flame test

1

yellow (flame)

1

(d) add dilute acid

*allow named acid*

1

(bubble gas produced through) limewater

1

(turns) cloudy / milky

*allow forms white precipitate*

1

**[9]**

**3.** (a) copper (II) → blue

iron (III) → brown

*more than one line from any box negates the mark*

1

1

(b) aluminium

*allow correct answer shown in box if answer line blank*

1

(c) (i) yellow  
*allow orange*

1

(ii) lilac  
*allow purple*

1

(iii) one colour masks the other  
*allow colours mixed*

1

[6]

4.

(a) **X:**  
Fe<sup>2+</sup> / iron(II), SO<sub>4</sub><sup>2-</sup> / sulfate  
*allow iron(II) sulfate*  
*or FeSO<sub>4</sub>*

1

**Y:**  
Na<sup>+</sup> / sodium, I<sup>-</sup> / iodide  
*allow sodium iodide*  
*or NaI*

1

**Z:**  
Fe<sup>3+</sup> / iron(III), Br<sup>-</sup> / bromide  
*allow iron(III) bromide*  
*or FeBr<sub>3</sub>*  
*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) ionic (bonding)

1

(ii) ions cannot move in solid **or** are in fixed positions  
*do not accept electrons / atoms / molecules*  
*ignore particles*  
**must** mention ions

1

but can move in solution

1

(b) silver chloride formed

1

which is insoluble

1

(c) (i) aluminium

1

calcium

*accept other metal ions that also give white precipitates (such as lead and zinc)*

1

(ii) add excess sodium hydroxide solution

*the second mark of each pair is dependent on the first mark being awarded.*

1

precipitate remains

1

carry out a flame test

1

not red / orange

*accept any colour that is not orange / red*

*give full credit for answers that correctly eliminate other cations in (c)(i) that would give white precipitates with a few drops of NaOH*

1

[11]

6.

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*

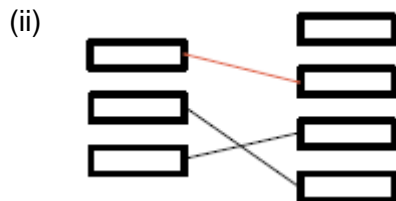
**[6]**

1

7. (a) (i) *method of introducing sample into flame*  
*e.g. wire / splint / spray*

*clean wire or colourless flame*  
*allow blue / roaring flame*

1



1

1

- (iii) (potassium) chloride  
*allow KCl or Cl<sup>-</sup>*

1

- (b) (i) copper  
*allow Cu<sup>2+</sup>*

1

- (ii) sulfate

1

[7]

8. (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]