

**Q1.**

This question is about water.

A student investigated pure water.

The student measured:

- the boiling point of pure water
- the pH of pure water.

(a) Complete the sentences.

Choose answers from the box.

0	4	7	10	25	100
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Pure water has a boiling point of \_\_\_\_\_ °C.

Pure water has a pH of \_\_\_\_\_.

(2)

(b) What could the student use to measure the pH of pure water?

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(1)

A different student investigated sea water.

Sea water contains dissolved solids.

This is the method used.

1. Measure a 50 cm<sup>3</sup> sample of the sea water.
2. Heat the sample until all the water has evaporated.
3. Measure the mass of solid that remains.
4. Repeat steps 1 to 3 three more times.

(c) Which **two** pieces of equipment were needed in this investigation?

Tick (✓) **two** boxes.

Balance

Measuring cylinder

Ruler

Thermometer

Timer

(2)

(d) The table below shows the results.

Sea water sample	Mass of solid that remained in grams
1	1.73
2	1.70
3	1.75
4	1.78

Calculate the mean mass of solid that remained.

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Mean mass = \_\_\_\_\_g

(2)

Sodium chloride is a dissolved solid in sea water.

Sodium chloride contains sodium ions and chloride ions.

(f) Complete the sentence.

Choose the answer from the box.

<b>crimson</b>	<b>lilac</b>	<b>yellow</b>
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The student tested sea water for sodium ions using a flame test.

The colour of the flame was \_\_\_\_\_.

(1)

(g) Complete the sentence.

Choose the answer from the box.

<b>brown</b>	<b>green</b>	<b>white</b>
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The student tested sea water for chloride ions by adding nitric acid and silver nitrate solution.

The colour of the precipitate formed was \_\_\_\_\_.

(1)

(Total 11 marks)

## Q2.

This question is about chemicals in fireworks.

Coloured flames are produced because of the metal ions in the fireworks.

(a) What colour flame would sodium ions produce?

\_\_\_\_\_ (1)

(b) Name a metal ion that would produce a green flame.

\_\_\_\_\_ (1)

(c) Some fireworks contain a mixture of metal ions.

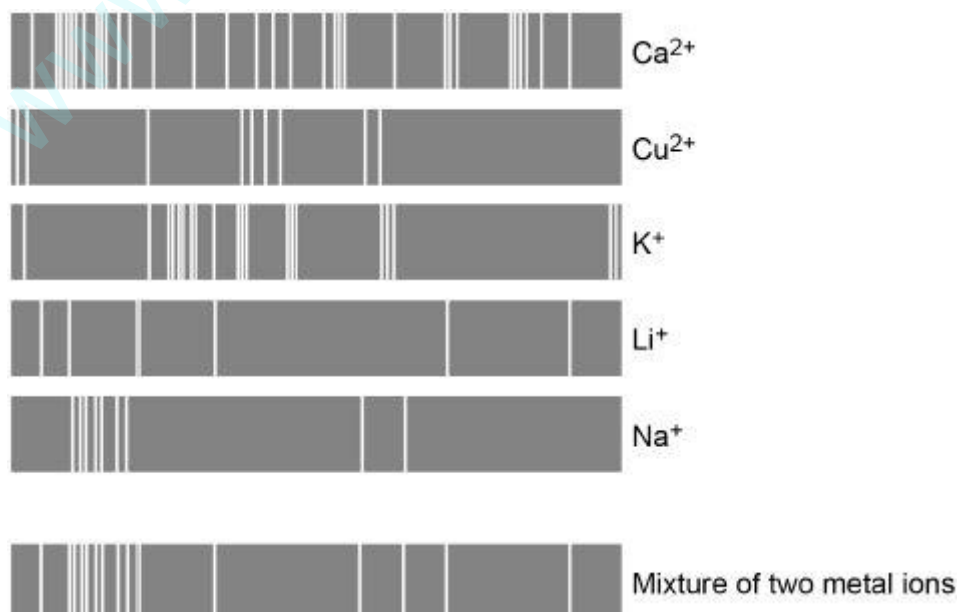
Why is it difficult to identify the metal ions from the colour of the flame?

\_\_\_\_\_  
\_\_\_\_\_ (1)

(d) Flame emission spectroscopy is used to identify metal ions in a firework.

The diagram below shows:

- the flame emission spectra of five individual metal ions
- a flame emission spectrum for a mixture of two metal ions.



Which **two** metal ions are in the mixture?

Tick **two** boxes.

Ca <sup>2+</sup>	<input type="checkbox"/>
Cu <sup>2+</sup>	<input type="checkbox"/>
K <sup>+</sup>	<input type="checkbox"/>
Li <sup>+</sup>	<input type="checkbox"/>
Na <sup>+</sup>	<input type="checkbox"/>

(2)

The compounds in fireworks also contain non-metal ions.

A scientist tests a solution of the chemicals used in a firework.

(e) Silver nitrate solution and dilute nitric acid are added to the solution.

A cream precipitate forms

Which ion is shown to be present by the cream precipitate?

\_\_\_\_\_

(1)

(f) Describe a test to show the presence of sulfate ions in the solution.

Give the result of the test if there are sulfate ions in the solution.

Test \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Result \_\_\_\_\_

\_\_\_\_\_

(3)

(Total 9 marks)

**Q3.**

Burgundy Mixture is a formulation used to kill fungi on grapevines.

It is made by mixing two compounds, **A** and **B**.

The ratio by mass of **A** : **B** in the mixture is 1 : 8

Scientists test a solution of compound **A**.

The table shows their results.

Test	Result
Add sodium hydroxide solution	Blue precipitate
Add dilute hydrochloric acid and barium chloride solution	White precipitate

(b) Which **two** ions are in compound **A**?

Choose the answers from the box.

<b>bromide</b>	<b>chloride</b>	<b>copper</b>
<b>iron(II)</b>	<b>iron(III)</b>	<b>sulfate</b>

\_\_\_\_\_ ions and \_\_\_\_\_ ions

(2)

(c) The scientists think that compound **B** is sodium carbonate.

Describe how the scientists can test a solution of **B** to see if sodium ions are present.

Give the result of the test if sodium ions are present.

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(2)

(d) Describe how the scientists can test a solution of **B** to see if carbonate ions are present.

Give the result of the test if carbonate ions are present.

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(3)  
(Total 9 marks)

**Q4.**

This question is about chemical tests.

- (a) Solutions of copper(II) ions and iron(III) ions produce coloured precipitates with sodium hydroxide solution.

Draw **one** line from each metal ion to the colour of the precipitate it produces.

Metal ion	Colour of precipitate
Copper(II) ( $\text{Cu}^{2+}$ )	Blue
	Brown
Iron(III) ( $\text{Fe}^{3+}$ )	Green
	White

(2)

- (b) Sodium hydroxide solution was added to a solution containing ions of a metal.

A white precipitate was produced. The white precipitate dissolved in excess sodium hydroxide solution.

Use the correct answer from the box to complete the sentence.

aluminium	magnesium	potassium
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The ions in the solution were ions of \_\_\_\_\_.

(1)

- (c) Low sodium salt contains sodium chloride and potassium chloride.

A student used a flame test on low sodium salt.

- (i) What is the colour produced by sodium ions in a flame test?

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(1)

(ii) What is the colour produced by potassium ions in a flame test?

\_\_\_\_\_

(1)

(iii) Why is it **not** possible to tell from the flame test that both ions are present in low sodium salt?

\_\_\_\_\_

\_\_\_\_\_

(1)

(Total 6 marks)

### Q5.

This question is about mixtures and analysis.

(a) Which **two** substances are mixtures?

Tick **two** boxes.

Air

Carbon dioxide

Graphite

Sodium Chloride

Steel

(2)

(b) Draw **one** line from each context to the correct meaning.

**Context**

**Meaning**

**Pure**  
substance in  
chemistry

A substance that has had nothing  
added to it

A single element or a single  
compound

A substance containing only atoms  
which have different numbers of  
protons

Pure  
substance in  
everyday life

A substance that can be separated  
by filtration

A useful product made by mixing  
substances

(2)

(c) What is the test for chlorine gas?

Tick **one** box.

A glowing splint relights

A lighted splint gives a pop

Damp litmus paper turns white

Limewater turns milky

(1)

(d) A student tested a metal chloride solution with sodium hydroxide solution.

A brown precipitate formed.

What was the metal ion in the metal chloride solution?

Tick **one** box.

Calcium

Copper(II)

Iron(II)

Iron(III)

(1)

(Total 6 marks)

### Q6.

This question is about chemical analysis.

(a) A student has solutions of three compounds, **X**, **Y** and **Z**.

The student uses tests to identify the ions in the three compounds.



The student records the results of the tests in the table.

Compound	Test			
	Flame test	Add sodium hydroxide solution	Add hydrochloric acid and barium chloride solution	Add nitric acid and silver nitrate solution
X	no colour	green precipitate	white precipitate	no reaction
Y	yellow flame	no reaction	no reaction	yellow precipitate
Z	no colour	brown precipitate	no reaction	cream precipitate

Identify the **two** ions present in each compound, **X**, **Y** and **Z**.

**X** \_\_\_\_\_

**Y** \_\_\_\_\_

**Z** \_\_\_\_\_

(3)

- (b) A chemist needs to find the concentration of a solution of barium hydroxide. Barium hydroxide solution is an alkali.

The chemist could find the concentration of the barium hydroxide solution using two different methods.

**Method 1**

- An excess of sodium sulfate solution is added to 25 cm<sup>3</sup> of the barium hydroxide solution. A precipitate of barium sulfate is formed.
- The precipitate of barium sulfate is filtered, dried and weighed.
- The concentration of the barium hydroxide solution is calculated from the mass of barium sulfate produced.

**Method 2**

- 25 cm<sup>3</sup> of the barium hydroxide solution is titrated with hydrochloric acid of known concentration.
- The concentration of the barium hydroxide solution is calculated from the result of the titration.

Compare the advantages and disadvantages of the two methods.

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(5)  
(Total 8 marks)

**Q7.**

Potash alum is a chemical compound.

Potash alum contains potassium ions, aluminium ions and sulfate ions.

- (a) Which **two** methods can be used to identify the presence of potassium ions in potash alum solution?

Tick (✓) **two** boxes.

Flame emission spectroscopy	<input type="checkbox"/>
Flame test	<input type="checkbox"/>
Measuring boiling point of solution	<input type="checkbox"/>
Paper chromatography	<input type="checkbox"/>
Using litmus paper	<input type="checkbox"/>

(2)

- (b) Sodium hydroxide solution is used to test for some metal ions.

Sodium hydroxide solution is added to a solution of potash alum until a precipitate forms.

Complete the sentence.

Choose the answer from the box.

blue	brown	green	white
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The colour of the precipitate formed is \_\_\_\_\_.

(1)

(c) Complete the sentence.

Choose the answer from the box.

<b>barium chloride solution</b>	<b>limewater</b>
<b>red litmus paper</b>	<b>silver nitrate solution</b>

Sulfate ions can be identified using dilute hydrochloric acid

and \_\_\_\_\_.

(1)

**Q8.**

A large amount of aluminium sulfate was accidentally added to the drinking water supply at a water treatment works.

(a) Describe a test to show that the drinking water contained aluminium ions.

Give the result of the test.

Test \_\_\_\_\_

\_\_\_\_\_

Result \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(3)

(b) Describe a test to show that the drinking water contained sulfate ions.

Give the result of the test.

Test \_\_\_\_\_

\_\_\_\_\_

Result \_\_\_\_\_

\_\_\_\_\_

(2)

**Q9.**

This question is about lithium carbonate.

Lithium carbonate is used in medicines.

The figure shows a tablet containing lithium carbonate.



(a) Lithium carbonate contains lithium ions and carbonate ions.

A student tested the tablet for lithium ions and for carbonate ions.

The student used:

- a metal wire
- dilute hydrochloric acid
- limewater.

Plan an investigation to show the presence of lithium ions and of carbonate ions in the tablet.

You should include the results of the tests for the ions.

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(6)

(b) The tablet also contains other substances.

The substances in tablets are present in fixed amounts.

What name is given to mixtures like tablets?

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(1)

**Q10.**

A bottle of washing soda was found in a school laboratory.  
The chemical name of washing soda is sodium carbonate.



A student tested the washing soda to prove that it was sodium carbonate.

(a) The student did a flame test to show that washing soda is a sodium compound.  
The student used a clean wire to put the washing soda into the flame.

(i) Why should the wire be clean when used for a flame test?

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(1)

(ii) The table shows some properties of metals.

**Two** of these are properties that the wire must have if it is used for a flame test.

Tick (✓) the **two** correct properties.

Property	Tick (✓)
Good electrical conductor	
High density	
High melting point	
Low boiling point	
Unreactive	

(2)

(iii) Which **one** of the following flame colours shows that washing soda is a sodium compound?

Draw a ring around your answer.

**brick-red**

**lilac**

**yellow-orange**

(1)

(b) The student used dilute hydrochloric acid to show that washing soda was a carbonate. Carbon dioxide gas was given off.

(i) Describe what you **see** happening when a gas is given off.

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(1)

(ii) The student used limewater to prove that the gas given off was carbon dioxide.

Complete this sentence by choosing the correct word from the box.

<b>clear</b>	<b>colourless</b>	<b>milky</b>
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When carbon dioxide reacts with limewater, the limewater turns

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(1)

(c) Instrumental methods are used to identify chemicals.

Give **two** advantages of instrumental methods compared with chemical tests by considering:

- the length of time to carry out a test
- the amount of chemical used.

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(2)

(Total 8 marks)

### Q11.

The colours of fireworks are produced by chemicals.



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- (a) Information about four chemicals is given in the table.

Complete the table below.

Chemical	Colour produced in firework
barium chloride	green
_____ carbonate	crimson
sodium nitrate	_____
calcium sulfate	red

(2)

- (b) Describe a test to show that barium chloride solution contains chloride ions.

Give the result of the test.

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(2)

- (c) A student did two tests on a solution of compound **X**.

**Test 1**

Sodium hydroxide solution was added.  
A blue precipitate was formed.

**Test 2**

Dilute hydrochloric acid was added.  
Barium chloride solution was then added.  
A white precipitate was formed.

The student concluded that compound **X** is iron(II) sulfate.

Is the student's conclusion correct?

Explain your answer.

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(3)

(Total 7 marks)

**Q12.**

Potash alum is a chemical compound.

The formula of potash alum is  $KAl(SO_4)_2$

- (a) Give a test to identify the Group 1 metal ion in potash alum.

You should include the result of the test.

Test \_\_\_\_\_  
\_\_\_\_\_

Result \_\_\_\_\_  
\_\_\_\_\_

(2)

- (b) Name **one** instrumental method that could identify the Group 1 metal ion **and** show the concentration of the ion in a solution of potash alum.

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(1)



A student identifies the other metal ion in potash alum.

The student tests a solution of potash alum by adding sodium hydroxide solution until a change is seen.

(c) Give the result of this test.

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(1)

(d) This test gives the same result for several metal ions.

What additional step is needed so that the other metal ion in potash alum can be identified?

Give the result of this additional step.

Additional step \_\_\_\_\_

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Result \_\_\_\_\_

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(2)

(e) Describe a test to identify the presence of sulfate ions in a solution of potash alum.

Give the result of the test.

Test \_\_\_\_\_

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Result \_\_\_\_\_

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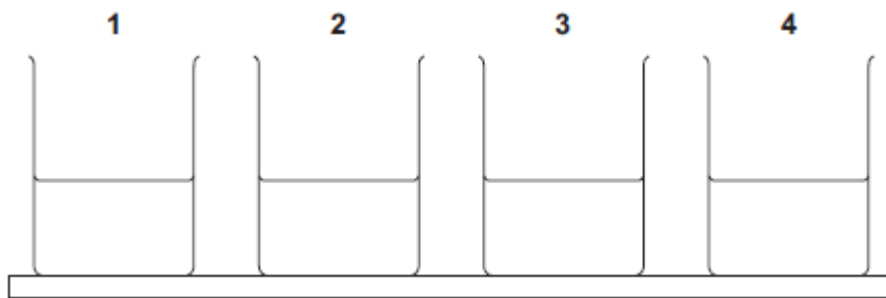
(3)

(Total 9 marks)

### Q13.

**In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

A group of students had four different colourless solutions in beakers **1**, **2**, **3** and **4**, shown in the figure below.



The students knew that the solutions were

- sodium chloride
- sodium iodide
- sodium carbonate
- potassium carbonate

but did **not** know which solution was in each beaker.

The teacher asked the class to plan a method that could be used to identify each solution.

She gave the students the following reagents to use:

- dilute nitric acid
- silver nitrate solution.

The teacher suggested using a flame test to identify the positive ions.

Outline a method the students could use to identify the four solutions.

You should include the results of the tests you describe.

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Extra space \_\_\_\_\_

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\_\_\_\_\_

(Total 6 marks)

**Q14.**

(a) The colours of fireworks are produced by chemicals.



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Three of these chemicals are lithium sulfate, potassium chloride and sodium nitrate.

(i) A student wants to carry out flame tests on these three chemicals.

Describe how to carry out a flame test.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

- (ii) Draw **one** line from each chemical to the correct flame colour.

The first one has been done for you.

Chemical	Flame colour
<input checked="" type="checkbox"/> lithium sulfate	<input type="checkbox"/> green
<input type="checkbox"/> potassium chloride	<input type="checkbox"/> crimson
<input type="checkbox"/> sodium nitrate	<input type="checkbox"/> yellow
	<input type="checkbox"/> lilac

(2)

- (iii) Dilute nitric acid and silver nitrate solution are added to solutions of the three chemicals.

A white precipitate forms in one of the solutions.

Which chemical produces the white precipitate?

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(1)

- (b) The student tests a fourth chemical, **X**.

- (i) The student adds sodium hydroxide solution to a solution of chemical **X**.

A blue precipitate is formed.

Which metal ion is in chemical **X**?

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(1)

- (ii) The student adds dilute hydrochloric acid to a solution of chemical **X** and then adds barium chloride solution.

A white precipitate is formed.

Which negative ion is in chemical **X**?

Draw a ring around the correct answer.

**chloride**

**nitrate**

**sulfate**

(1)

(Total 7 marks)

**Q15.**

A student investigated an egg shell.



Trish Steel [CC-BY-SA-2.0], via Wikimedia Commons

(a) Draw a ring around the correct answer to complete each sentence.

(i) **Test 1**

Dilute hydrochloric acid was added to the egg shell.

Carbon dioxide gas was produced which turned limewater

milky.

blue.

red.

This test shows that the egg shell must contain

carbonate ions.

chloride ions.

sulfate ions.

(2)

(ii) **Test 2**

The student then did a flame test.

He used the solution remaining after dilute hydrochloric acid was added to the egg shell.

The flame test showed that the egg shell contained calcium ions because

the flame was

red.

blue.

lilac.

(1)

(b) Some scientists investigated the amount of lead found in egg shells.

They used a modern instrumental method which was more *sensitive* and more *accurate* than older methods.

- (i) Draw a ring around the correct answer to complete the sentence.

The modern instrumental method is more *sensitive*, which means that

it can measure 

larger
much larger
smaller

 amounts of lead than older methods.

(1)

- (ii) Tick (✓) the meaning of more *accurate*.

	Tick (✓)
The measurement is given to more decimal places.	
The answer obtained is closer to the true value.	
The equipment used is more expensive.	

(1)

(Total 5 marks)

### Q16.

This question is about chemical analysis.

A student tested copper sulfate solution and calcium iodide solution using flame tests.

This is the method used.

1. Dip a metal wire in copper sulfate solution.
2. Put the metal wire in a blue Bunsen burner flame.
3. Record the flame colour produced.
4. Repeat steps 1 to 3 using the same metal wire but using calcium iodide solution.

- (a) What flame colour is produced by copper sulfate solution?

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(1)

- (b) Calcium compounds produce an orange-red flame colour.

The student left out an important step before reusing the metal wire.

The student's method did **not** produce a distinct orange-red flame colour using calcium iodide solution.

Explain why.

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(2)

(c) The student added sodium hydroxide solution to:

- copper sulfate solution
- calcium iodide solution.

Give the results of the tests.

Copper sulfate solution \_\_\_\_\_

Calcium iodide solution \_\_\_\_\_

(2)

(d) To test for sulfate ions the student added dilute hydrochloric acid to copper sulfate solution.

Name the solution that would show the presence of sulfate ions when added to this mixture.

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(1)

(e) To test for iodide ions the student added dilute nitric acid to calcium iodide solution.

Name the solution that would show the presence of iodide ions when added to this mixture.

Give the result of the test.

Solution \_\_\_\_\_

Result \_\_\_\_\_

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(2)

(Total 8 marks)

## Mark schemes

### Q1.

- (a) 100 1
- 7 1
- must be in this order*
- (b) pH probe / meter
- or**
- universal indicator (paper / solution)
- allow wide range indicator (paper / solution)* 1
- (c) balance 1
- measuring cylinder 1
- (d) (mean =)  $\frac{1.73 + 1.70 + 1.75 + 1.78}{4}$  1
- = 1.74 (g) 1
- (f) yellow 1
- (g) white 1
- [11]**

### Q2.

- (a) yellow
- allow orange*  
*allow orange-yellow* 1
- (b) copper (ion)
- allow Cu<sup>2+</sup>*  
*allow copper (II)*  
*allow barium (ion)*  
*allow Ba<sup>2+</sup>* 1
- (c) (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

(d)  $\text{Li}^+$

1

$\text{Na}^+$

1

(e) bromide (ion)

*allow  $\text{Br}^-$*

*ignore bromine*

1

(f) add barium chloride (solution)

*allow barium nitrate (solution)*

1

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

[9]

### Q3.

(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]

**Q4.**

(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]

**Q5.**

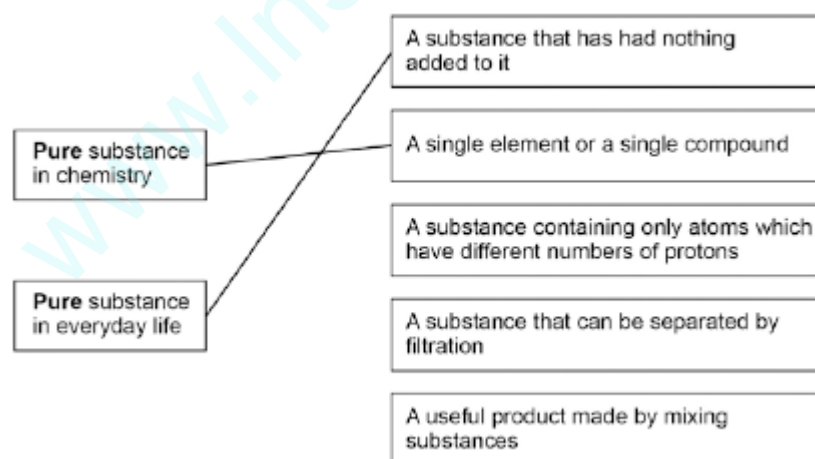
(a) Air

2

Steel

1

(b)



Allow 1 mark for the correct meanings linked to context but incorrect way around

1

(c) Damp litmus paper turns white

1

(d) Iron(III)

1

## Q6.

(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]

## Q7.

(a) flame emission spectroscopy 1

flame test 1

(b) white 1

(c) barium chloride (solution) 1

**Q8.**

- (a) add sodium hydroxide (solution to water sample) 1
- white precipitate (forms)  
*dependent on correct test in MP1* 1
- (precipitate which is) soluble in excess (NaOH)  
*dependent on correct test in MP1* 1
- (b) add barium chloride (solution) **and** (dilute) hydrochloric acid (to water sample)  
*allow barium nitrate (solution)*  
*allow (dilute) nitric acid* 1
- white precipitate (forms)  
*dependent on addition of barium chloride / nitrate (solution) in MP1* 1

**Q9.**

- (a) **Level 3:** The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced. 5-6
- 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
- (b) formulation(s) 1

**Q10.**

- (a) (i) so there are no impurities  
*accept no other chemicals / not contaminated  
allow to get the correct result* 1
- (ii) high melting point 1
- unreactive 1
- (iii) yellow-orange 1
- (b) (i) bubbles / fizz / effervescence  
*ignore any named gas* 1
- (ii) milky 1
- (c) fast(er) 1
- small(er) amount 1

[8]

**Q11.**

- (a) lithium  
*allow Li<sup>+</sup> / Li* 1
- yellow  
*allow orange* 1
- (b) silver nitrate (solution)  
*incorrect test = 0 marks  
ignore (nitric) acid  
do **not** allow other named acids* 1
- white precipitate 1
- (c) blue precipitate (with sodium hydroxide) indicates copper ions  
*allow Cu<sup>2+</sup>* 1
- and white precipitate (with barium chloride) indicates sulfate ions  
*allow SO<sub>4</sub><sup>2-</sup>  
accept compound X is copper sulfate / CuSO<sub>4</sub> for 1 mark* 1

but iron(II) ions produce a green precipitate (with sodium hydroxide)

1

[7]

**Q12.**

(a) flame test

*allow description of flame test*

1

lilac (flame)

1

(b) flame emission spectroscopy

1

(c) white precipitate

*ignore precipitate dissolves*

1

(d) (add) excess sodium hydroxide (solution)

*allow (add) more sodium hydroxide (solution)*

1

precipitate dissolves

1

(e) add barium chloride (solution)

*allow add barium nitrate (solution)*

1

add (dilute) hydrochloric acid

*allow add (dilute) nitric acid*

1

white precipitate

*dependent on MP1 being awarded*

1

[9]

**Q13.**

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]

**Q14.**

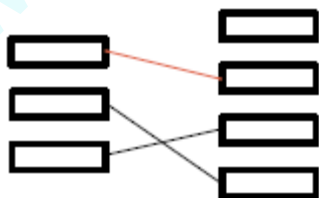
- (a) (i) *method of introducing sample into flame*  
*e.g. wire / splint / spray*

1

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

1

(ii)



1

1

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

1

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

(ii) sulfate

1

1

[7]

**Q15.**

(a) (i) milky

1

carbonate ions

1

(ii) red

1

(b) (i) smaller

1

(ii) The answer obtained is closer to the true value

1

[5]

**Q16.**

(a) green

*allow blue-green*

1

(b) did not clean the metal wire (between tests)

**or**

copper sulfate (solution) is still present

1

(so) colours are mixed / blended / masked

1

(c) (copper sulfate solution) blue precipitate

*allow blue solid*

1

(calcium iodide solution) white precipitate

*allow white solid*

1

(d) barium chloride (solution)

*allow barium nitrate (solution)*

1

(e) silver nitrate (solution)

1

yellow precipitate

*allow yellow solid*

*allow pale yellow precipitate / solid*

1



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