AQA Chemistry GCSE

Required Practical 7 - Identifying Ions
Past Exam Questions

Q1. 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 ☐

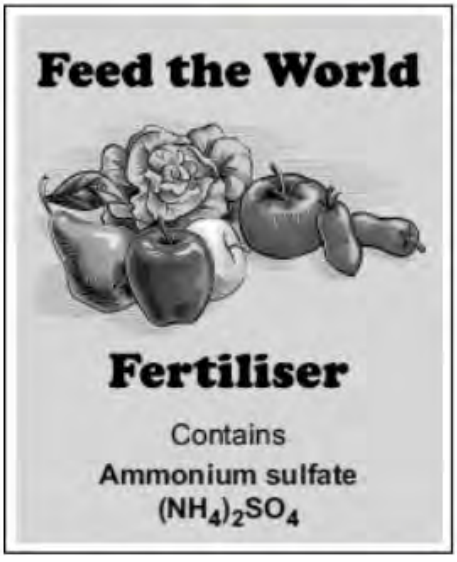
(1)

Q2. 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)

Q3. Ammonium sulfate is an artificial fertiliser.



(a) (i) When this fertiliser is warmed with sodium hydroxide solution, ammonia gas is given off.

Describe and give the result of a test for ammonia gas.

Test .....

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Result .....

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(2)

(ii) Describe and give the result of a chemical test to show that this fertiliser contains sulfate ions (SO_4^{2-}).

Test .....

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Result .....

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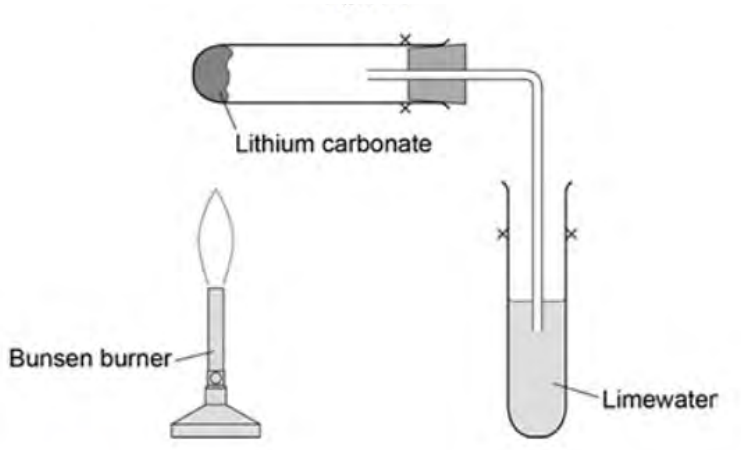
(2)

Q4. Lithium carbonate decomposes when heated.
The equation shows the decomposition of lithium carbonate.

$$Li_2CO_3(s) \rightarrow Li_2O(s) + CO_2(g)$$

Figure 4 shows the apparatus a student used to decompose lithium carbonate.



Why does the limewater bubble?

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(1)

(f) The student repeated the experiment with potassium carbonate.
The limewater did not bubble. Suggest why there were no bubbles in the limewater.

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(1)

Q5. 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?

.....

(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.

.....

.....

(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.

clear	colourless	milky

When carbon dioxide reacts with limewater, the limewater turns .....

(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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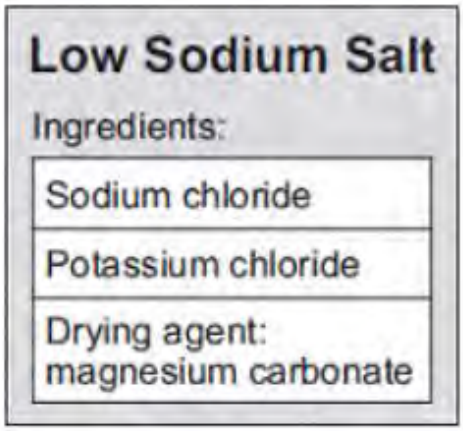
(2)

(Total 8 marks)

Q5.Low sodium salt is used on food. This label is from a packet of low sodium salt.



A chemist tests the low sodium salt for the substances on the label.

(a) The chemist tests for sodium ions and potassium ions using a flame test.

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

(i)

In a flame test, sodium ions produce a

lilac / red / yellow

colour.

(1)

(ii)

In a flame test, potassium ions produce a

lilac / red / yellow

colour.

(1)

(b) The chemist added hydrochloric acid to low sodium salt. Carbon dioxide gas was produced.

Describe the test for carbon dioxide and give the result of the test.

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(2)

(c) The chemist made a solution of low sodium salt.

	Tick (✓)
Barium chloride solution	
Silver nitrate solution	
Sodium sulfate solution	

(1)

(ii) Sodium hydroxide solution is used to test for magnesium ions.

Draw a ring around the colour of precipitate produced by this test.

brown **green** **white**

(1)

(Total 6 marks)

Q6.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)

Q7. Cheshunt mixture is a powder containing copper sulfate, $CuSO_4$, and ammonium carbonate, $(NH_4)_2CO_3$

(a) A student tested the Cheshunt mixture.
(i) Hydrochloric acid was added. A gas was produced that turned limewater milky.

Complete the sentence.

The gas was ..... which shows

that ..... ions are in the mixture.

(2)

(ii) Sodium hydroxide solution was added.
A gas was produced that indicates that ammonium ions are in the mixture.

Complete the sentence.

The gas was ..... which turns

damp red ..... blue.

(2)

(b) Cheshunt mixture is dissolved in water before it is used.
When the student dissolved the Cheshunt mixture in water it formed a blue solution.

(i) Suggest how the student knew that copper ions are in this solution.

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(1)

(ii) The student tested the Cheshunt solution and the result of the test indicated that sulfate ions are in the solution.

Complete the sentence.

The student added a solution of ..... in the presence of

dilute hydrochloric acid and a ..... precipitate was produced.

(2)

Q8. Limestone is used as a building material. Acid rain erodes limestone.

(a) Limestone contains calcium carbonate.
The symbol equation for the reaction of calcium carbonate with hydrochloric acid is shown.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

Describe a test to show that carbon dioxide is produced in this reaction.
Give the result of the test.

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..... (2)

Q9 (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.

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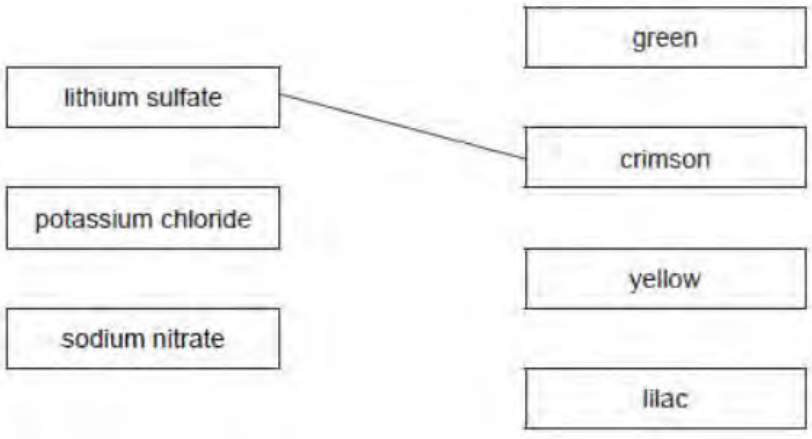
(2)

(ii) Draw one line from each chemical to the correct flame colour.
The first one has been done for you.

Chemical	Flame colour
lithium sulfate	crimson
potassium chloride	
sodium nitrate	
	green
	yellow
	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)

Q10. Alums are salts. They have been used since ancient times in dyeing and medicine and still have many uses today.
Three alums are shown in the table:

Name	Ions present
Ammonium alum	NH_4^+ Al^{3+} SO_4^{2-}
Potassium alum	K^+ Al^{3+} SO_4^{2-}
Sodium alum	Na^+ Al^{3+} SO_4^{2-}

(a) These alums contain sulfate ions.
Describe and give the result of a chemical test to show this.

Test .....

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Result .....

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(2)

(b) These alums contain aluminium ions (Al3+).
Describe how sodium hydroxide solution can be used to show this.

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(2)

(c) Aluminium ions do not give a colour in flame tests. However, flame tests can be used to distinguish between these three alums.
Explain how these three alums could be identified from the results of flame tests.

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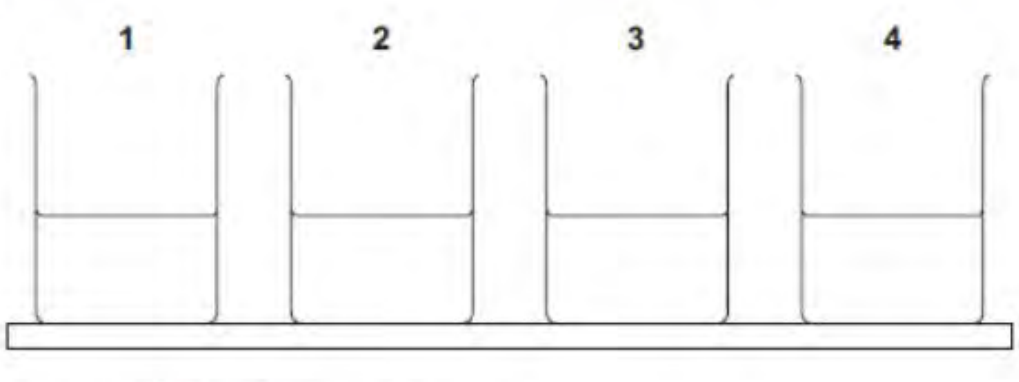
(2)

Q11. 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)

Q11. Four bottles of chemicals made in the 1880s were found recently in a cupboard during a Health and Safety inspection at Lovell Laboratories.

The chemical names are shown below each bottle.

(a) You are provided with the following reagents:

- aluminium powder
- barium chloride solution acidified with dilute hydrochloric acid
- dilute hydrochloric acid
- silver nitrate solution acidified with dilute nitric acid
- sodium hydroxide solution.
- limewater
- red litmus paper

(i) Describe tests that you could use to show that these chemicals are correctly named. In each case give the reagent(s) you would use and state the result.

Test and result for carbonate ions:

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Test and result for chloride ions:

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Test and result for nitrate ions:

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Test and result for sulfate ions:

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(4)

(ii) Suggest why a flame test would not distinguish between these four chemicals.

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(1)

(b) Instrumental methods of analysis linked to computers can be used to identify chemicals.
Give two advantages of using instrumental methods of analysis.
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(2)

(Total 7 marks)