Group 2

Question Paper

Level	International A Level
Subject	Chemistry
Exam Board	Edexcel
Topic	Chemistry Lab Skills 1
Sub Topic	Group 2
Booklet	Question Paper

Time Allowed: **63 minutes**

Score: **/52**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 A white solid, **A**, has one metal cation and an anion consisting of two or more elements.

(a) A flame test is carried out on compound **A** by mixing the solid with concentrated hydrochloric acid and using a wire to place some of the mixture formed in the hottest part of a Bunsen flame.

(i) The wire is made from a metal or an alloy. Name a suitable material for the wire and give **one** reason why this material is used.

(2)

Material .....

Reason .....

.....

(ii) Suggest **one** reason for using hydrochloric acid in this test, rather than another strong acid.

(1)

.....

.....

.....

(iii) In a flame test for solid **A**, a red colour is observed. Identify, by name or formula, one Group 1 metal ion and one Group 2 metal ion that could be present.

(2)

Group 1 metal ion .....

Group 2 metal ion .....

(b) When solid **A** is added to water, some dissolves to form a colourless solution.

When phenolphthalein is added to this mixture, it turns pink.

When dilute hydrochloric acid is added to the mixture, the temperature increases and a colourless solution forms, but no gas is given off.

(i) Identify, by name or formula, the anion present in **A**.

(1)

.....

(ii) Write the **ionic** equation for the reaction that causes the temperature to increase. State symbols are not required.

(1)

(c) When dilute sulfuric acid is added to the solution of **A**, a white precipitate forms.

(i) Name the white precipitate.

(1)

.....

(ii) Write the **ionic** equation, including state symbols, for the formation of this precipitate.

(1)

(d) Give the formula of the white solid, **A**.

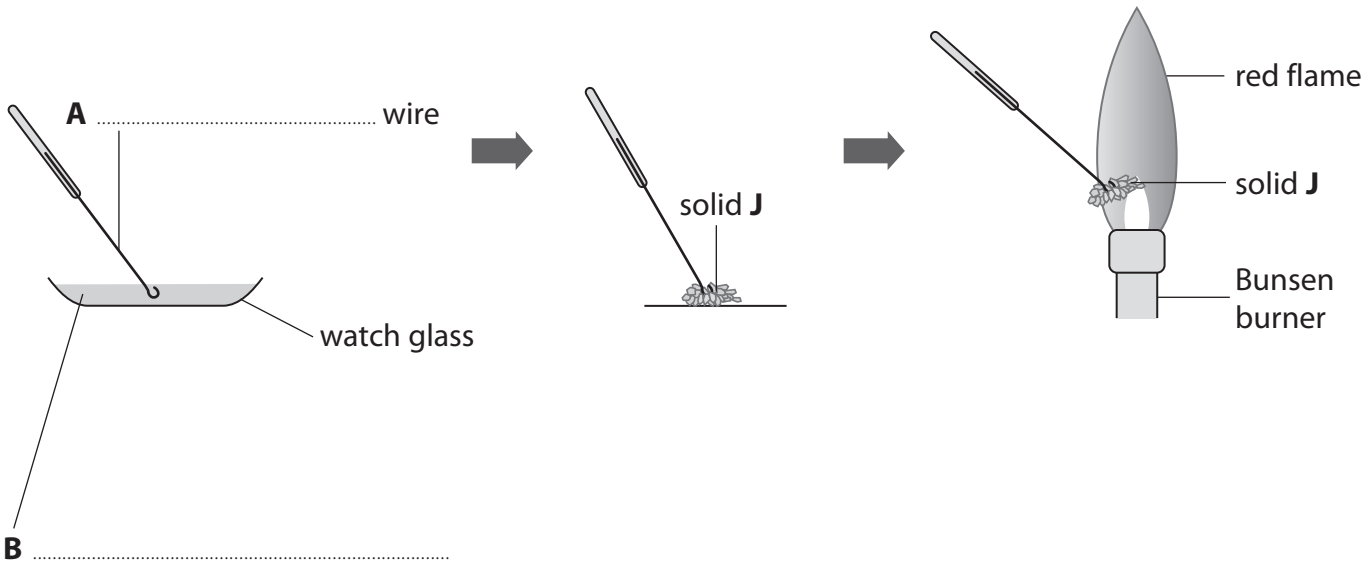
(1)

(Total for Question 1 = 10 marks)

2 A series of tests is carried out on a white solid, **J**, which is a mixture of two compounds. One compound contains a Group 1 cation, and the other a Group 2 cation. The two compounds contain the same anion.

(a) Complete the labels **A** and **B** in the diagram below, which shows the procedure and result for a flame test on solid **J**.

(2)



(b) It is known that the Group 2 cation in **J** gives no colour in a flame test, so the red colour seen must be due to the Group 1 cation.

Give the name or formula of the Group 1 cation, which is responsible for the red colour observed in the flame test, and give the name or formula of the Group 2 cation.

(2)

Group 1 cation .....

Group 2 cation .....

(c) Dilute hydrochloric acid is added to a sample of **J**.
J dissolves in the acid but there is no other change.

(i) If **J** contained a carbonate anion, what would be the observation on the addition of dilute hydrochloric acid?

(1)

.....

(ii) Give the name or formula of another anion which would produce the same observation with dilute hydrochloric acid as the carbonate anion.

(1)

.....

(iii) Aqueous barium chloride is then added to the solution of **J** in hydrochloric acid.
A white precipitate forms.

Give the **formulae** for the two salts present in **J**.

(2)

.....

.....

(Total for Question 2 = 8 marks)

3 (a) A series of tests is carried out on a white solid, **X**, which contains one cation and one anion.

Complete the table below.

	Test	Observation	Inference (Name or formula)	
(i)	Carry out a flame test on **X**	A persistent yellow colour	The cation in **X** is	**(1)**
(ii)	Add dilute hydrochloric acid to the solid **X** Bubble the gas given off into limewater	Effervescence The limewater turns cloudy	The anion in **X** is	**(1)**

(iii) Write a balanced equation, including state symbols, for the reaction between the gas formed in the reaction in (a)(ii) and limewater (calcium hydroxide solution).

(2)

(b) Another white solid, **Y**, also contains one cation and one anion.

Complete the table below.

	Test	Observation	Inference	
(i)	Carry out a flame test on **Y**	.....	Strontium ions are present	**(1)**
(ii)	Add dilute nitric acid and dilute aqueous silver nitrate to a solution of **Y**	....	The anion in **Y** is probably a chloride	**(1)**

(iii) A further test is carried out on the mixture formed in (b)(ii). This confirms that **Y** contains chloride ions, and **not** bromide or iodide ions.

Describe this test and give the result.

(2)

Test.....

.....

Result.....

.....

(iv) What would you observe when the mixture formed in (b)(ii) is left to stand in sunlight?

Name the **product** responsible for this observation.

(2)

Observation.....

Product.....

(c) When aqueous solutions of **X** and **Y** are mixed, a white precipitate forms.

Write an **ionic** equation for the reaction which produces the white precipitate.
State symbols are not required.

(1)

(Total for Question 3 = 11 marks)

4 A series of tests was carried out on **A**, a white powder. **A** is known to contain one cation and one anion. Complete the table below. You may use names or formulae in your answers.

	Test	Observation	Inference	
(a)	Carry out a flame test on **A**.	.....	Cation is calcium.	**(1)**
(b)	Add a few drops of dilute nitric acid to an aqueous solution of **A**, followed by aqueous silver nitrate. Then add concentrated aqueous ammonia solution.	....	Anion is probably iodide. This confirms the anion is iodide.	**(2)**
(c)	Add an aqueous solution of chlorine to an aqueous solution of **A**.	The colour of the resulting solution is	The colour is due to the formation of	**(2)**
(d)	Add an aqueous solution of starch to the mixture formed in (c).	The colour of the resulting mixture is	This confirms the inference made in (c).	**(1)**
(e)	Add a solution of sodium carbonate to an aqueous solution of **A**. When there is no further change, add dilute hydrochloric acid to the mixture.	A white precipitate forms. The precipitate dissolves in the acid and bubbles of gas are seen.	The precipitate is ..... The gas is	**(2)**

(f) When **concentrated** sulfuric acid is added to a **solid** sample of **A**, there is a vigorous redox reaction.

(i) Identify, by name or formula, the product formed by the oxidation of the iodide ion in this reaction. Describe the appearance of this product.

(2)

Product .....

Appearance .....

(ii) Identify, by name or formula, one product formed when the concentrated sulfuric acid is reduced. Describe an observation you could make that shows this product has formed.

(2)

Product .....

Observation .....

.....

(Total for Question 4 = 12 marks)

5 A series of tests was carried out on **X**, a white solid, which is known to contain one cation and one anion.

(a) **X** gave a pale green colour in a flame test. Give the name or formula of the cation in **X**.

(1)

.....

(b) When dilute nitric acid was added to a sample of solid **X**, no reaction occurred. Suggest the name or formula of an anion that could **not** be present in **X**.

(1)

.....

(c) Dilute nitric acid was added to an aqueous solution of **X**, and then aqueous silver nitrate was added to the mixture. A white precipitate formed, which dissolved in dilute aqueous ammonia.

Give the name or formula of the anion in **X**.

(1)

.....

(d) A sample of the white precipitate in (c) was left to stand in sunlight.

(i) What colour change would be seen?

(1)

.....

(ii) Name the substance responsible for the new colour that appeared in (d)(i).

(1)

.....

(e) **Dilute** sulfuric acid was added to an aqueous solution of **X**.

(i) What change would be observed?

(1)

.....

(ii) Write an equation for the reaction in (e)(i). Include state symbols.

(2)

(f) (i) A few drops of **concentrated** sulfuric acid were added to a small portion of **solid X** in a test tube. Misty fumes, but no other vapours, were seen.

Identify these fumes by name or formula.

(1)

.....

(ii) Describe a further **chemical** test to confirm the identity of the gas responsible for the misty fumes.

Give the expected result of the test.

(2)

Test .....

.....

Result .....

.....

(Total for Question 5 = 11 marks)