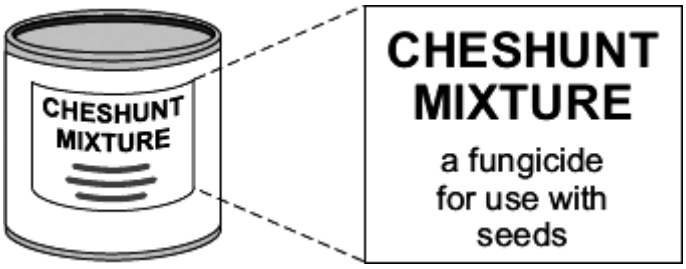
Q1. Cheshunt mixture is a powder containing copper sulfate, $CuSO_4$, and ammonium carbonate, $(NH_4)_2CO_3$



(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)

(Total 7 marks)

Q2. Read the information in the box and then answer the questions.

Seidlitz Powder is the name of a medicine.

Seidlitz Powder comes as two powders. One powder is wrapped in white paper and contains tartaric acid ($C_4H_6O_6$). The other powder is wrapped in blue paper and contains potassium sodium tartrate ($KNaC_4H_4O_6$) and sodium hydrogencarbonate ($NaHCO_3$).

The contents of the blue paper are completely dissolved in water and then the contents of the white paper are added.

The equation which represents this reaction is:

$$C_4H_6O_6\ (aq) + 2NaHCO_3\ (aq) \longrightarrow Na_2C_4H_4O_6\ (aq) + 2H_2O\ (l) + 2CO_2\ (g)$$

(a) Describe and give the result of a test to identify the gas produced in this reaction.

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(2)

(b) One of the chemicals in Seidlitz Powder is potassium sodium tartrate ($KNaC_4H_4O_6$).

Suggest why it would be difficult to identify **both** potassium ions and sodium ions in potassium sodium tartrate using a flame test.

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(1)

(c) Some Seidlitz Powder was bought on the Internet. However, when tested, it was found to be only magnesium sulfate.

(i) Describe and give the result of a chemical test to show that magnesium sulfate contains sulfate ions.

Test .....

.....

Result .....

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(2)

(ii) Magnesium sulfate contains magnesium ions.

Describe what you **see** when sodium hydroxide solution is added to a solution of magnesium sulfate.

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(1)
(Total 6 marks)

Q3. Read the information about protecting the bottoms of ships.

A Copper-bottomed Investment

From the 16th to the 19th century, the bottoms of many wooden ships were protected from marine organisms by being covered with sheets of metal.

At first lead was used on the bottoms of ships, then copper was used until 1832 when Muntz Metal replaced it. Muntz Metal is an alloy of two transition metals, copper and zinc.

Table of data

	Lead	**Copper**	**Muntz Metal**
Cost (£/kg)	£1.20	£3.20	£2.30
Melting point (°C)	327	1083	904
Stops sea worms attacking wood	Yes	Yes	Yes
Stops barnacles and seaweed sticking to the bottom of the ship	No	Yes	Yes

(a) Use the information to answer the following questions.

(i) Suggest why copper replaced lead.

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(1)

(ii) Suggest why Muntz Metal replaced copper.

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(1)

(b) A sample of Muntz Metal contains a very small amount of iron as an impurity.

(i) Name an instrumental method of analysis that could be used to detect iron.

.....

(1)

(ii) Suggest why an instrumental method would detect the iron in this sample of Muntz Metal but a chemical method is **not** likely to be successful.

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(1)

(c) Today, ships are made from steel. Steels are alloys of iron, a transition metal.

Give **two** properties of transition metals that make them suitable for making ships.

Property 1 .....

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Property 2 .....

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(2)

(Total 6 marks)

Q4. 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 (SO_4^{2-}).

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 (Al^{3+}).

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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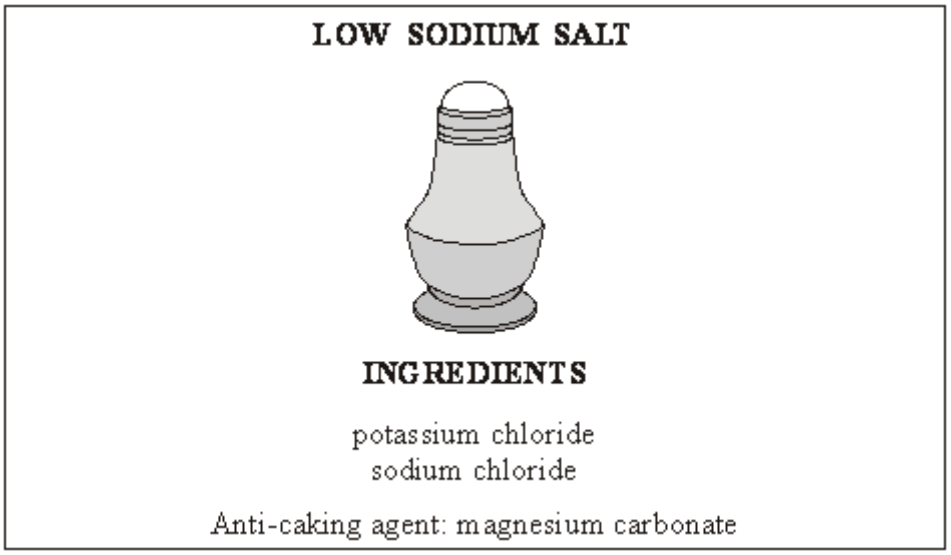
(2)
(Total 6 marks)

Q5. The label is from a packet of Low Sodium Salt.



(a) A student tested some Low Sodium Salt to show that it contains carbonate ions and chloride ions.

(i) Describe and give the result of a test for carbonate ions.

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(2)

(ii) A student identified chloride ions using acidified silver nitrate solution.

State what you would **see** when acidified silver nitrate solution is added to a solution of Low Sodium Salt.

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(1)

(iii) Flame tests can be used to identify potassium ions and sodium ions.

Suggest why it is difficult to identify **both** of these ions in Low Sodium Salt using a flame test.

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(1)

(b) Read the following information and then answer the questions.

Salt – friend or foe?

Sodium chloride (salt) is an essential mineral for our health. It is used to flavour and preserve foods. Too much sodium in our diet may increase the risk of high blood pressure and heart disease. Heart disease is the biggest cause of death in the United Kingdom. Some people claim that excess sodium is a poison that can cause cancer, while others say that more evidence is needed.

Many processed foods contain salt, so it is easy to exceed the recommended daily upper limit of about 5 g of salt per person. A 'healthier' amount should be about 3 g. In the United Kingdom many people consume over 10 g of salt each day.

One way to reduce sodium in our diet is to use Low Sodium Salt. This has two thirds of the sodium chloride replaced by potassium chloride.

A national newspaper asked readers for their views on two options.

Option 1: Ban the use of sodium chloride in foods.

Option 2: Reduce the amount of sodium chloride in all foods to a 'healthier' level.

(i) Suggest why Option **1** was rejected.

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(1)

(ii) Suggest **two** advantages and **one** disadvantage of Option **2**.

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(3)
(Total 8 marks)

Q6. This label has been taken from a packet of *My Baby Food*.

MY BABY FOOD

Infant milk
Pure and natural

Closest to mothers' breast milk
Contains traces of essential minerals

500 g

One of the minerals in *My Baby Food* is calcium carbonate, $CaCO_3$.

(a) Chemical tests are used to identify elements and compounds.

(i) A flame test can be used to identify calcium ions.
What colour do calcium ions give in a flame test?

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(1)

(ii) When a flame test was carried out on *My Baby Food*, the presence of calcium ions was **not** seen. A yellow flame was produced.
Name the ion which gives a yellow flame test.

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(1)

(iii) Suggest **one** advantage of using an instrumental method to detect the elements present in *My Baby Food*.

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(1)

(iv) Name an instrumental method for detecting elements.

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(1)

(b) Read the information in the box below and then answer the question.

Calcium carbonate occurs naturally as marble and limestone. They are important building materials and are often used for gravestones.

Calcium carbonate is also an essential mineral for good health and is present in many baby foods in small amounts.

My Baby Food is recommended as being the closest to a mother's own breast milk. It is given free to mothers in the developing world – without it their babies might die of malnutrition.

Responsible Mothers Are Us (RMAU) is a United Kingdom pressure group. They want to ban chemicals in baby foods. The group was founded by Mrs I. M. Right who has made a career in 'goodness' and is paid from donations given to *RMAU* by members of the public.

When interviewed, she said: "Calcium carbonate is a chemical and so it is a pollutant. *My Baby Food* must be banned to prevent the mass medication of babies. I don't feed my baby the stuff of gravestones."

Many people do **not** agree with Mrs Right's ideas.

Suggest why.

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(3)
(Total 7 marks)

Q7. Chlorine and bromine are important Group 7 elements.

(a) Explain why chlorine is added to drinking water.

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(1)

(b) Describe what you would **see** when bromine water is added to an unsaturated organic compound.

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(1)

(c) Bromine can be extracted from seawater. The dissolved bromide ions are reacted with chlorine. Bromine and chloride ions are formed.

(i) Complete and balance the equation below, which represents the reaction between chlorine and bromide ions.

$Cl_2 + 2Br^- \rightarrow$ ..... + ...

(1)

(ii) Describe what you **see** when chlorine is added to a solution containing bromide ions.

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(1)

(d) In terms of electronic structure:

(i) state why bromine and chlorine are both in Group 7

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(1)

(ii) explain why bromine is less reactive than chlorine.

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(3)

(e) What is the result of adding acidified silver nitrate solution to a solution containing:

(i) chloride ions

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(1)

(ii) bromide ions?

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(1)
(Total 10 marks)

Q8. Chemical tests can be used to identify compounds.

The table shows the results of some tests carried out on three solutions, **A**, **B** and **C**.

Solution	Flame Test	Hydrochloric acid is added	Sodium hydroxide solution is added	Silver nitrate solution is added
A	Yellow	Carbon dioxide gas produced		
B	Brick-red		White precipitate insoluble in excess sodium hydroxide solution	White precipitate
C			Dark green precipitate	

Use the information in the table to identify solutions **A**, **B** and **C**.

Give the name of:

(a) solution **A**; .....

(2)

(b) solution **B**; .....

(2)

(c) the metal ion in solution **C**. .....

(1)

(Total 5 marks)