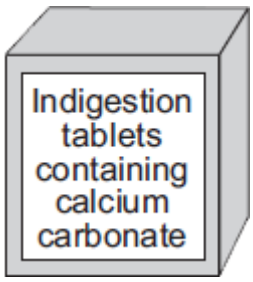
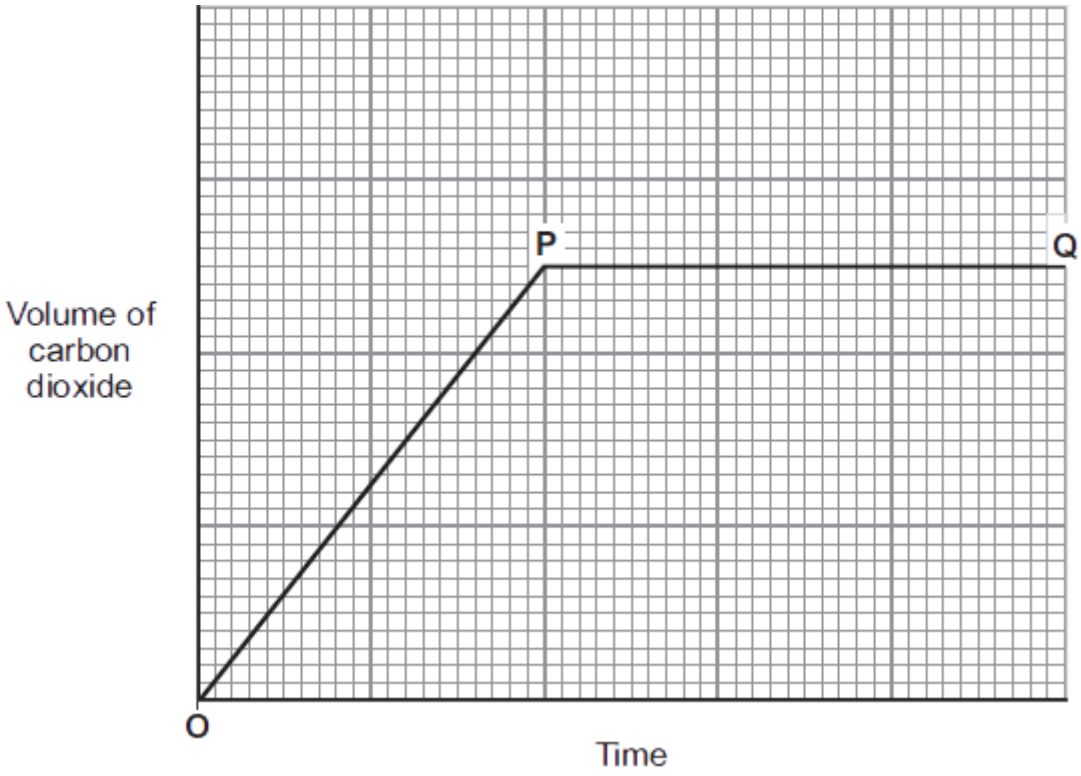
Chemical Analysis Part 2

Q1.

Human stomachs contain hydrochloric acid.
Stomach ache can be caused by too much acid in the stomach.
Indigestion tablets can be used to reduce the amount of acid in the stomach.



(a) The graph shows how the volume of carbon dioxide produced changes with time, after some calcium carbonate is added to hydrochloric acid.



(i) Complete the sentence to explain what happens between **O**and **P**.

Between **O** and **P** the calcium carbonate and hydrochloric acid _____

(1)

(ii) Complete the sentence to explain what happens at **P**.

At **P** the calcium carbonate and hydrochloric acid _____

because _____

(2)

(iii) Describe the test for carbon dioxide gas.

Test _____

Result of the test _____

(2)

(b) Calcium carbonate is found in limestone.
Limestone is removed from the ground by quarrying.

Photograph supplied by Stockbyte/Thinkstock

Tick (✓) **one**advantage and tick (✓) **one**disadvantage of quarrying limestone.

Statement	Advantage Tick (✓)	Disadvantage Tick (✓)
Quarrying limestone destroys the shells and skeletons of marine organisms that formed the limestone.		
Quarrying limestone releases dust, and lorries release carbon dioxide from burning diesel fuel.		
Quarrying limestone provides building materials, employment and new road links.		
Quarrying limestone removes ores from the ground.		

(2)

(Total 7 marks)

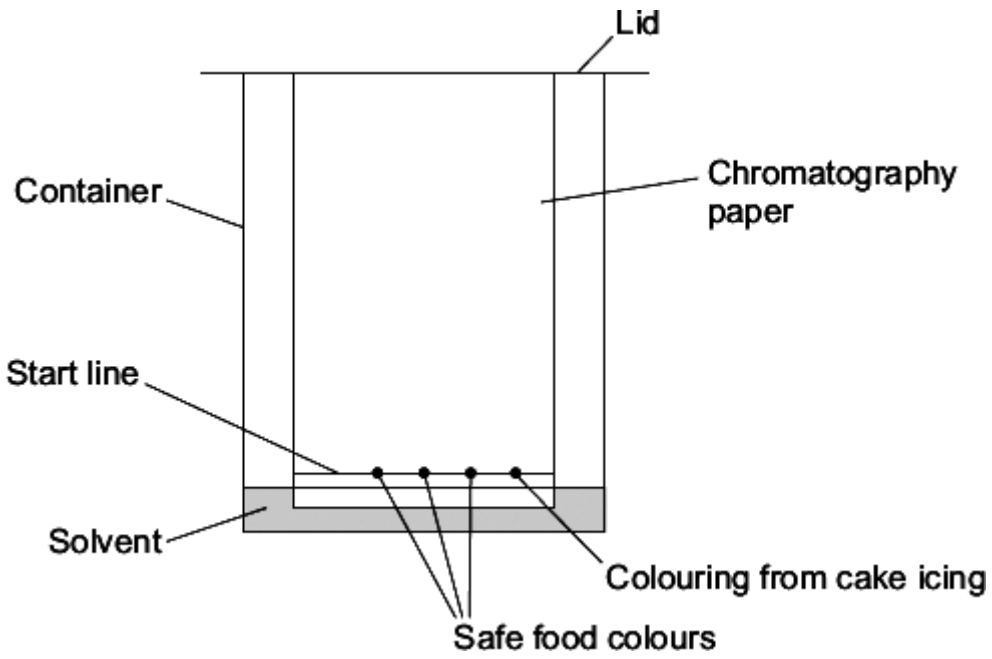
Q2.

Icing on cakes is tested to check that safe colours were used when they were made.

By Megan Chromik [CC-BY-SA-2.0], via Wikimedia Commons

Paper chromatography is one method of testing which colours are in cake icing.

(a) The diagram shows an experiment a student did.



(i) Suggest why there is a lid on the container.

_____

_____

(1)

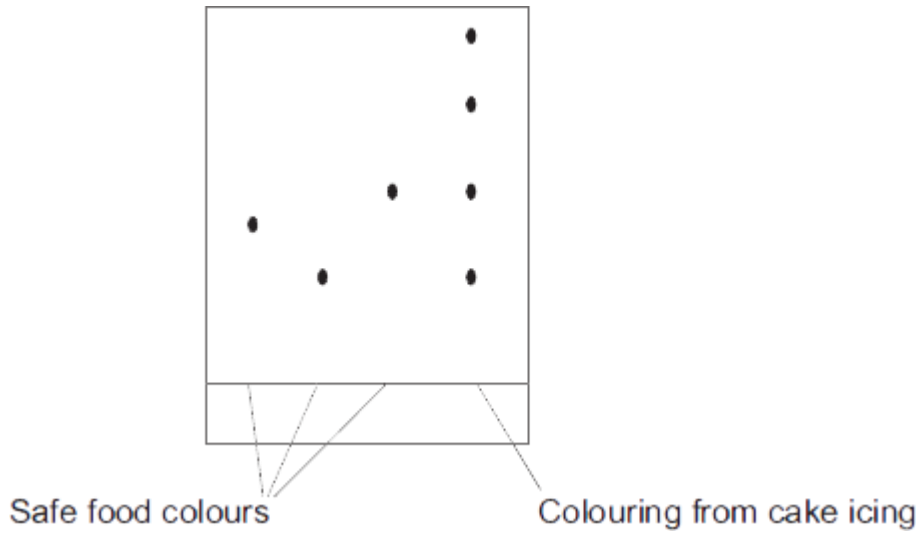
(ii) The start line should be drawn in pencil **not** in ink.
Suggest why.

_____

_____

(1)

(b) The diagram shows the results of the paper chromatography experiment.



(i) How many different food colours were used in the colouring from the cake icing?

_____

(1)

(ii) Is the cake icing safe to eat?

Give a reason for your answer.

_____

_____

(1)

(c) Gas chromatography linked to mass spectroscopy is an example of an instrumental method. This method was used on a mixture of solvents.

(i) Give **two** advantages of gas chromatography compared with paper chromatography.

_____

_____

_____

_____

(2)

(ii) What does gas chromatography do to the mixture of solvents?

_____

_____

(1)

(iii) What information does mass spectroscopy give?

_____

_____

(1)

(Total 8 marks)

Q3.

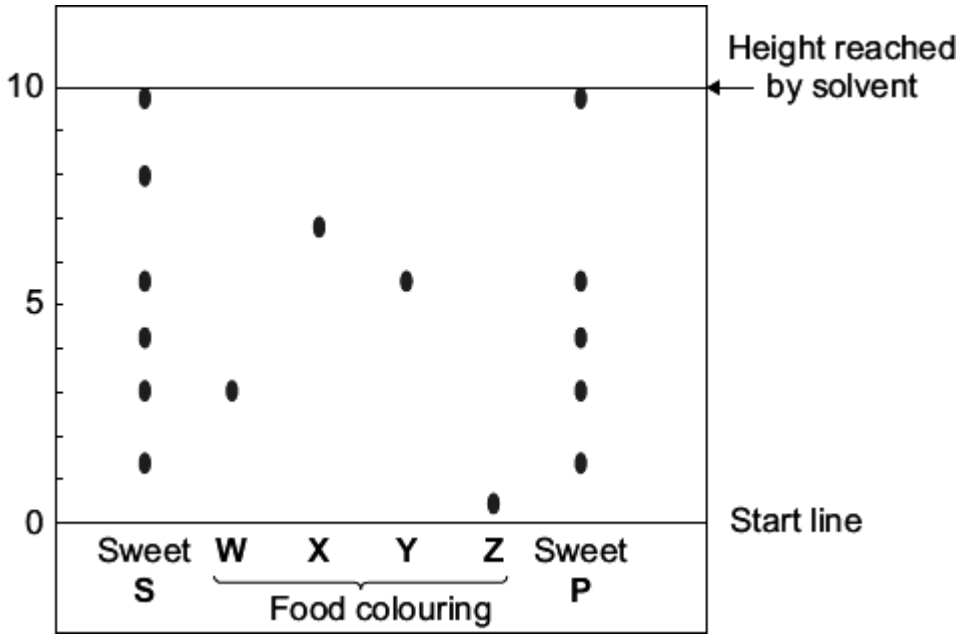
Read the article.

> **Problem food colourings**
>
> Scientists say they have evidence that some food colourings cause hyperactive behaviour in young children.
>
> These food colourings are added to some sweets.

W, **X**, **Y** and **Z** are food colourings that may cause hyperactive behaviour in young children.

A scientist used chromatography to see if these food colourings were used in two sweets, **S** and **P**.

The results are shown on the chromatogram.



(a) Food colourings, such as **W**, **X**, **Y** and **Z**, are added to some sweets.

Suggest **one** reason why.

_____

_____

(1)

(b) In chromatography, the R_f value = $\frac{\text{distance moved by the colouring}}{\text{distance moved by the solvent}}$

Use the scale on the chromatogram to help you to answer this question.

Which food colouring, **W**, **X**, **Y** or **Z**, has an R_f value of 0.7?

(1)

(c) From the chromatogram, what conclusions can the scientist make about the colourings in sweets **S** and **P**?

_____

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 5 marks)

Q4.

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)

Q5.

A student investigated an egg shell.

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

(a) The student did some tests on the egg shell.

The student's results are shown in the table below.

Test		Observation
1	Dilute hydrochloric acid was added to the egg shell.	A gas was produced. The egg shell dissolved, forming a colourless solution.
2	A flame test was done on the colourless solution from test **1**.	The flame turned red.
3	Sodium hydroxide solution was added to the colourless solution from test **1**.	A white precipitate formed that did not dissolve in excess sodium hydroxide solution.
4	Silver nitrate solution was added to the colourless solution from test **1**.	A white precipitate formed.

(i) The student concluded that the egg shell contains carbonate ions.

Describe how the student could identify the gas produced in test **1**.

_____

_____

_____

_____

(2)

(ii) The student concluded that the egg shell contains aluminium ions.

Is the student's conclusion correct? Use the student's results to justify your

answer.

_____

_____

_____

_____

(2)

(iii) The student concluded that the egg shell contains chloride ions.

Is the student's conclusion correct? Use the student's results to justify your answer.

_____

_____

_____

_____

(2)

(b) Some scientists wanted to investigate the amount of lead found in egg shells. They used a modern instrumental method which was *more sensitive* than older methods.

(i) Name **one** modern instrumental method used to identify elements.

_____

_____

(1)

(ii) What is the meaning of *more sensitive*?

_____

_____

(1)

(Total 8 marks)

Q6.

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

Seidlitz Powder is a medicine. Seidlitz Powder comes as two powders. One powder is wrapped in white paper and contains tartaric acid. The other powder is wrapped in blue paper and contains sodium hydrogencarbonate. The contents of the blue paper are dissolved in water and the contents of the white paper are added. This causes a reaction that produces carbon dioxide gas. The mixture is safe to drink when the reaction stops.

(a) Suggest why Seidlitz Powder comes as two separate powders.

_____

(1)

(b) The reaction produces carbon dioxide gas.

(i) What would you see during the reaction?

_____

(1)

(ii) Which state symbol in a chemical equation shows that carbon dioxide is a gas?

Draw a ring around **one** answer.

(s) **(l)** **(aq)** **(g)**

(1)

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

Carbon dioxide can be identified because it turns | limescale / limestone / limewater | milky.

(1)

(c) Sodium hydrogencarbonate contains sodium ions. Sodium ions can be identified by flame tests.

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

Sodium ions give a | blue / red / yellow | flame.

(1)

(d) Some Seidlitz Powder was bought on the Internet for £5. However, when tested, it was found to be only magnesium sulfate, worth a few pence.

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

(i) The test for sulfate ions uses | barium chloride / silver nitrate / sodium hydroxide | solution.

(1)

blue

(ii) A positive test for sulfate ions produces a | red / white | precipitate..

(1)

(iii) Suggest **one** disadvantage of buying medicines on the Internet.

_____

_____

(1)

(Total 8 marks)

Q7.

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:

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

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

_____

_____

_____

_____

(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.

_____

_____

(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 _____

_____

(2)

(ii) Magnesium sulfate contains magnesium ions.

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

_____

_____

(1)

(Total 6 marks)

Q8.

This is part of an article about food additives.

THE PERIL OF FOOD ADDITIVES

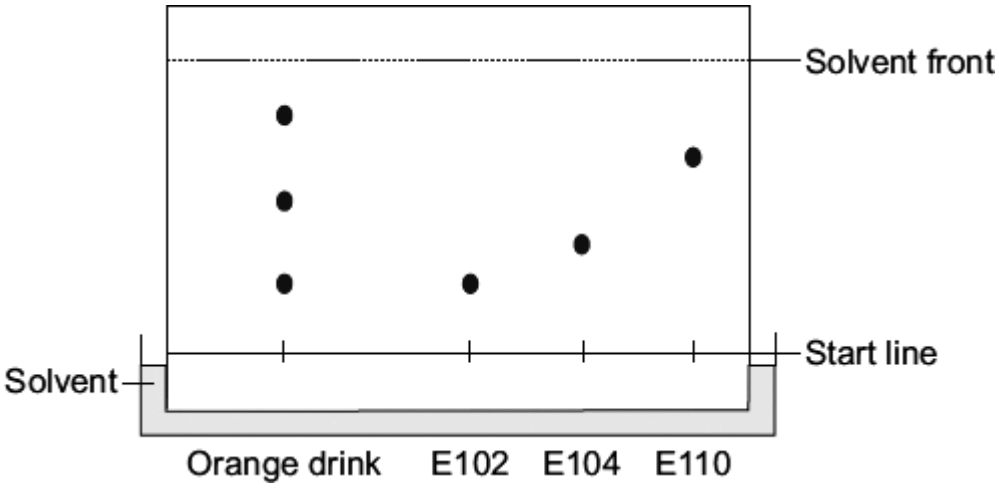
Some orange drinks contain the additives E102 (Tartrazine), E104 (Quinoline Yellow) and E110 (Sunset Yellow).
These three additives are thought to cause hyperactivity in children.

(a) Tick (✓) **two** reasons why a manufacturer of orange drinks uses these additives.

Reason	Tick (✓)
to make the drink healthier	
to improve the appearance of the drink	
because they are permitted colours	
because they are expensive	

(2)

(b) A scientist tested an orange drink to find out if it contained these additives.
The result of the test is shown.



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

The test that the scientist did is called

chromatography.

cracking.

distillation.

(1)

(ii) How many coloured additives are there in the orange drink? _____

(1)

(iii) The scientist concluded that the orange drink contained only **one** of the additives E102, E104 and E110.

Explain why.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q9.

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.

_____

_____

(1)

(ii) Suggest why Muntz Metal replaced copper.

_____

_____

(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.

_____

_____

(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 _____

_____

Property 2 _____

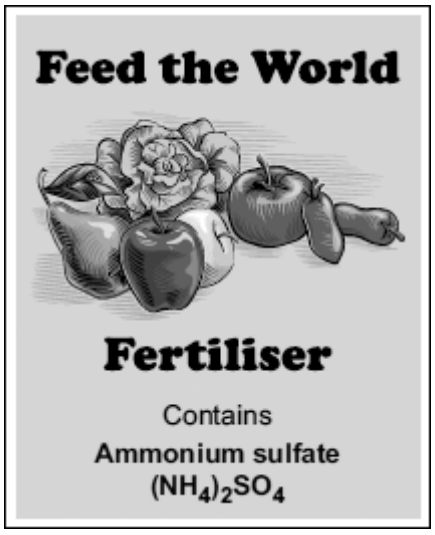
_____

(2)

(Total 6 marks)

Q10.

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 _____

_____

Result _____

_____

(2)

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

Test _____

_____

Result _____

_____

(2)

(b) Ammonium sulfate is made by reacting sulfuric acid (a *strong* acid) with ammonia solution (a *weak* alkali).

(i) Explain the meaning of *strong* in terms of ionisation.

_____

(1)

(ii) A student made some ammonium sulfate in a school laboratory.

The student carried out a titration, using a suitable indicator, to find the volumes of sulfuric acid and ammonia solution that should be reacted together.

Name a suitable indicator for strong acid-weak alkali titrations.

_____

(1)

(iii) The student found that 25.0 cm^3 of ammonia solution reacted completely with 32.0 cm^3 of sulfuric acid of concentration 0.050 moles per cubic decimetre.

The equation that represents this reaction is:

$$2H_2SO_4(aq) + 2NH_3(aq) \rightarrow (NH_4)_2SO_4\ (aq)$$

Calculate the concentration of this ammonia solution in moles per cubic decimetre.

_____

_____

_____

_____

_____

Concentration = _____ moles per cubic decimetre

(3)

(iv) Use your answer to (b)(iii) to calculate the concentration of ammonia in grams per cubic decimetre.

(If you did not answer part (b)(iii), assume that the concentration of the ammonia solution is 0.15 moles per cubic decimetre. This is **not** the correct answer to part (b)(iii).)

Relative formula mass of ammonia (NH_3) = 17.

_____

_____

_____

Concentration = _____ grams per cubic decimetre

(2)

(Total 11 marks)

Q11.

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 student tested these alums to show which ions were present.

(a) The student did a flame test on these alums. A sample of each alum was held on a wire in a colourless flame.

In (a)(i) and (a)(ii) use the correct word from the box to complete each sentence.

blue	**lilac**	**yellow**	**green**

(i) Sodium ions give a _____ flame.

(1)

(ii) Potassium ions give a _____ flame.

(1)

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

The wire used in a flame test should have a high

- density.
- electrical conductivity.
- melting point.

(1)

(b) Draw a ring around the correct word to complete the sentences.

(i) The student tested a solution of each salt for sulfate ions (SO_4^{2-}).

The student added dilute hydrochloric acid and [barium chloride / nitric acid / silver nitrate] solution and a white [gas / liquid / solid] was formed.

(2)

(ii) The student tested a solution of each salt for aluminium ions (Al^{3+}).

The student added sodium hydroxide solution and a [green / red / white] precipitate was formed. When excess sodium hydroxide solution was added, the precipitate [boiled. / condensed. / dissolved.]

(2)

(Total 7 marks)

Q12.

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 _____

_____

Result _____

_____

(2)

(b) These alums contain aluminium ions (Al^{3+}).

Describe how sodium hydroxide solution can be used to show this.

_____

_____

_____

_____

_____

(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.

_____

_____

_____

_____

_____

(2)

(Total 6 marks)

Q13.

Chemical tests can be used to detect and identify elements and compounds.

A jar of a chemical from 1870 is shown.

Copperas was a name used for iron(II) sulfate, $FeSO_4$. It does not contain any copper!

(a) A student tested solutions of copperas to show which ions it contained.

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

(i) The student tested for iron(II) ions, Fe^{2+}

The student added a solution of

barium chloride.

silver nitrate.

sodium hydroxide.

The colour of the precipitate formed was

green

red.

white

The precipitate was a

liquid.

gas.

solid

(3)

(ii) The student tested for sulfate ions, SO_4^{2-}

The student added dilute hydrochloric acid and

barium chloride

silver nitrate

sodium hydroxide

solution.

The colour of the precipitate formed was

green

red.

white

Sulfuric acid (H_2SO_4) should **not** be used instead of hydrochloric acid (HCl) when testing for sulfate ions.

This is because sulfuric acid contains

chloride ions, Cl^-
nitrate ions, NO_3^-
sulfate ions, SO_4^{2-}

(3)

(b) A flame test can be used to identify the metal ions in a compound.

How do you carry out a flame test?

_____

_____

(1)

(c) The elements in a compound can also be detected and identified using instrumental methods of analysis.

State **one** advantage of using instrumental methods compared with chemical tests.

_____

_____

(1)

(Total 8 marks)

Q14.

Ethene can be identified using instrumental methods.

(i) Name **one** instrumental method used to identify elements or compounds.

_____

_____

(1)

(ii) Give **one** advantage of using instrumental methods compared with chemical tests.

_____

_____

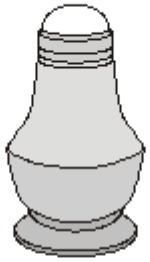
(1)

(Total 2 marks)

Q15.

The label is from a packet of Low Sodium Salt.

LOW SODIUM SALT



INGREDIENTS

potassium chloride
sodium chloride

Anti-caking agent: magnesium carbonate

(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.

_____

_____

_____

_____

(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.

_____

(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.

_____

_____

(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.

_____

_____

(1)

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

_____

_____

_____

_____

_____

_____

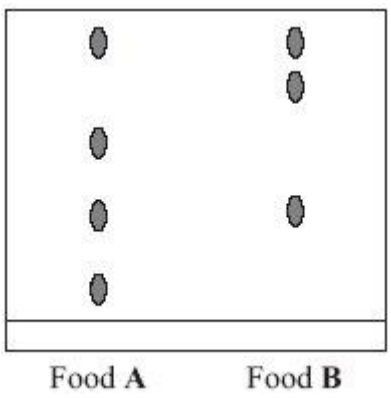
_____

(3)

(Total 8 marks)

Q16.

The result of a process used to detect and identify the colours in two foods, **A** and **B**, is shown.



(i) Describe the differences between the colours used in food **A** and food **B**.

_____

_____

_____

_____

(2)

(ii) Tick (✓) the name of the process used to detect and identify colours in food.

Process	(✓)
chromatography	
extraction	
hardening	

(1)

(Total 3 marks)

Q17.

Chemical tests can be used to identify ions in solutions.

(a) List **A** gives the names of two sulfates in solution.
List **B** gives the results of adding sodium hydroxide solution.

Draw a straight line from each sulfate in List **A** to its correct test result in List **B**.

List A **Name of sulfate in solution**	**List B** **Result of adding sodium hydroxide solution**
	A blue precipitate formed
Copper sulfate	
	A white precipitate formed
Iron(II) sulfate	
	A green precipitate formed

(2)

(b) Suggest why clean test tubes were used for each test.

_____

_____

(1)

(c) Draw a ring around the correct colour to complete this sentence.

Sulfate solutions react with barium chloride solution to give a

blue
green
white

precipitate.

(1)

(Total 4 marks)

Q18.

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?

_____

(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.

_____

(1)

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

_____

_____

(1)

(iv) Name an instrumental method for detecting elements.

_____

(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.

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q19.

Chlorine and bromine are important Group 7 elements.

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

_____

_____

(1)

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

_____

_____

(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.

_____

_____

(1)

(d) In terms of electronic structure:

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

_____

_____

(1)

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

_____

_____

_____

_____

_____

_____

_____

(3)

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

(i) chloride ions

_____

(1)

(ii) bromide ions?

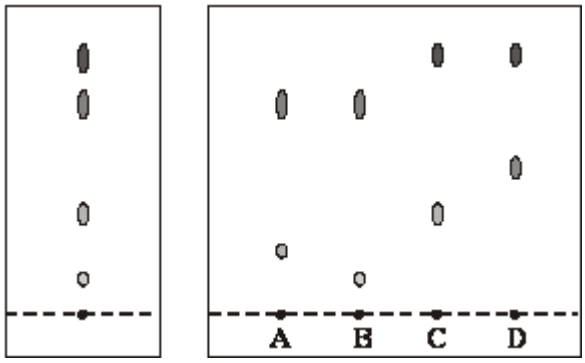
_____

(1)

(Total 10 marks)

Q20.

Chromatography was carried out on a sample of soft drinks to check that they contained only colours that were safe. This is the result.



Safe colours Colours from the soft drinks

What conclusions about the safety of the colours in the soft drinks **A, B, C** and **D** can be made from the results shown by chromatography?

_____

_____

_____

_____

_____

(Total 2 marks)

Q21.

Some farmed salmon have a coloured additive in the food that they are given. This is a permitted additive that improves the colour of the fish meat.

A sample of the colour is extracted from a salmon.

Explain how paper chromatography could be used to confirm that this is the permitted additive.

_____

_____

_____

_____

_____

_____

(Total 3 marks)

Q22.

A bottle of washing soda was found in a school laboratory. The modern 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.

Put a tick (✓) next to the **two** correct properties.

Property	(✓)
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.

Describe some advantages of instrumental methods compared with chemical tests by considering:

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

_____

_____

_____

_____

_____

(2)

(Total 8 marks)

Q23.

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

The chemicals are correctly named.

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.

(i) Describe tests to show that these chemicals are correctly named.

In each case give the reagent(s) you would use and state what you would see.

Test and result for carbonate ions:

_____

_____

Test and result for chloride ions:

_____

_____

Test and result for nitrate ions:

_____

Test and result for sulfate ions:

(5)

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

(1)

(b) Instrumental methods of analysis linked to computers can be used to identify chemicals.

Describe **two** advantages of using instrumental methods of analysis.

(2)

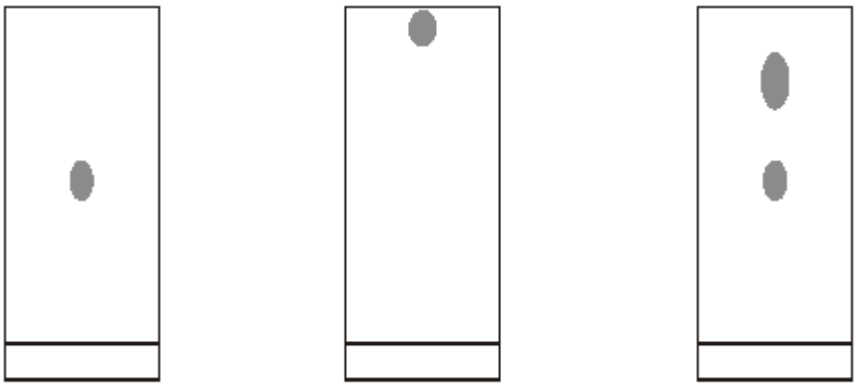
(Total 8 marks)

Q24.

(a) Suggest why it is important to be able to identify the colour additives in food.

(1)

(b) A brown colour used in sweets was analysed using chromatography. The results were compared with those from E104 and E133.



What do the results tell you about the brown colour and its suitability for use in sweets?

_____

_____

_____

_____

_____

_____

(3)

(c) Once all the unsuitable colours are removed, the company claims that its sweets are now 'free from artificial colours'.

Does this mean that the sweets contain no additives? Explain your answer.

_____

_____

_____

_____

(2)

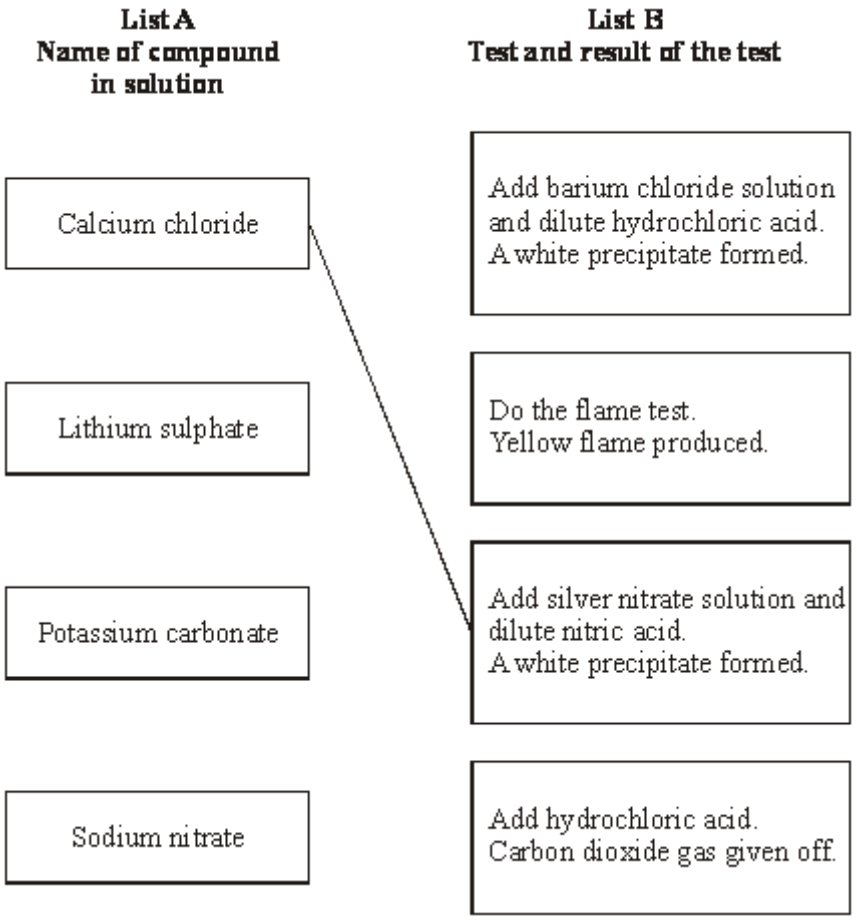
(Total 6 marks)

Q25.

Chemical tests can be used to identify compounds.

(a) List **A** gives the names of four compounds in solution. List **B** gives tests and the result of the tests.

Draw a straight line from each compound in List **A** to its test and test result in List **B**. The first one has been done for you.



(2)

(b) State what you would **see** when sodium hydroxide solution reacts with copper sulphate solution.

_____

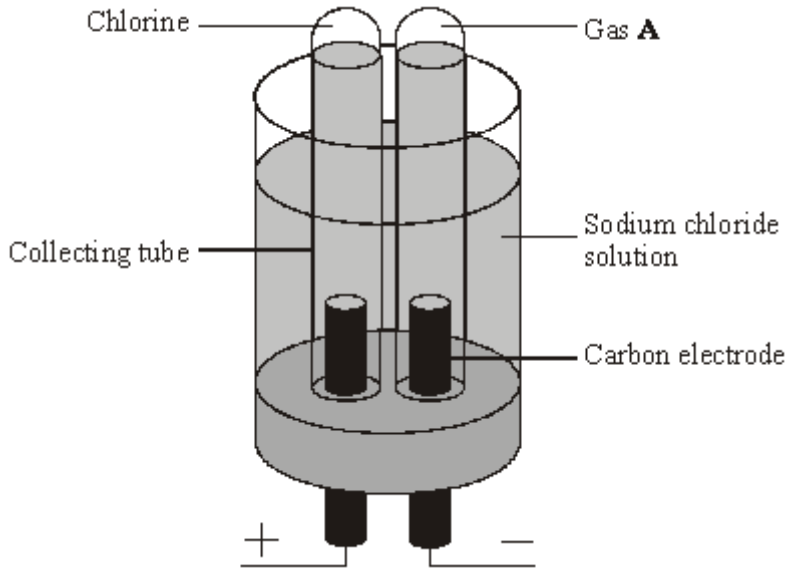
_____

(2)

(Total 4 marks)

Q26.

The electrolysis of sodium chloride solution is an important industrial process. The apparatus shown below can be used to show this electrolysis in the laboratory.



(a) Name gas **A**.

_____

(1)

(b) Chlorine is produced at the positive electrode. Describe and give the result of a chemical test to prove that the gas is chlorine.

_____

_____

_____

_____

(2)

(c) Chloride ions move to the positive electrode. Explain why.

_____

_____

(1)

(d) A small quantity of chlorine is added to drinking water. Explain why.

_____

_____

(1)

(e) The solution around the negative electrode becomes alkaline. Name the ion which makes the solution alkaline.

_____

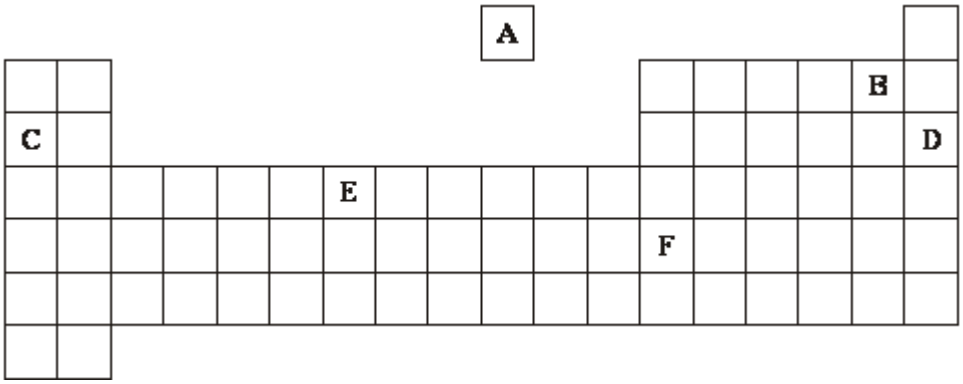
_____

(1)

(Total 6 marks)

Q27.

The diagram shows an outline of the periodic table.



Choose your answers **only** from the letters shown on the table above.

The periodic table on the Data Sheet may help you to answer this question.

Which element, **A** to **F**:

(a) is in Group 3;

_____

(1)

(b) is a metal which floats on water and reacts violently to make an alkaline solution and hydrogen gas;

_____

(1)

(c) is a gas which burns with a squeaky pop?

_____

(1)

(Total 3 marks)

Q28.

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	White precipitate

			hydroxide solution	
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)

Q29.

Hydrogen peroxide, H_2O_2, is often used as a bleach. It decomposes forming water and oxygen.

(a) (i) Write the balanced chemical equation for the decomposition of hydrogen peroxide.

_____

(3)

(ii) Give a test for oxygen.

Test _____

Result of test _____

_____

(2)

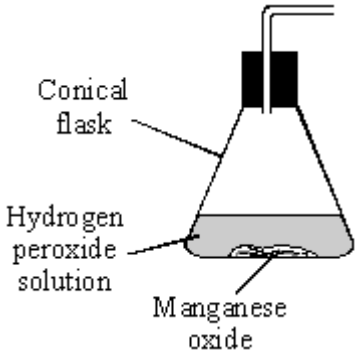
(b) The rate of decomposition of hydrogen peroxide at room temperature is very slow. Manganese oxide is a catalyst which can be used to speed up the decomposition. Complete the sentence.

A catalyst is a substance which speeds up a chemical reaction. At the end of the reaction, the catalyst is _____

(1)

(c) Two experiments were carried out to test if the amount of manganese oxide, MnO_2 affected the rate at which the hydrogen peroxide decomposed.

(i) Complete the diagram to show how you could measure the volume of oxygen formed during the decomposition.

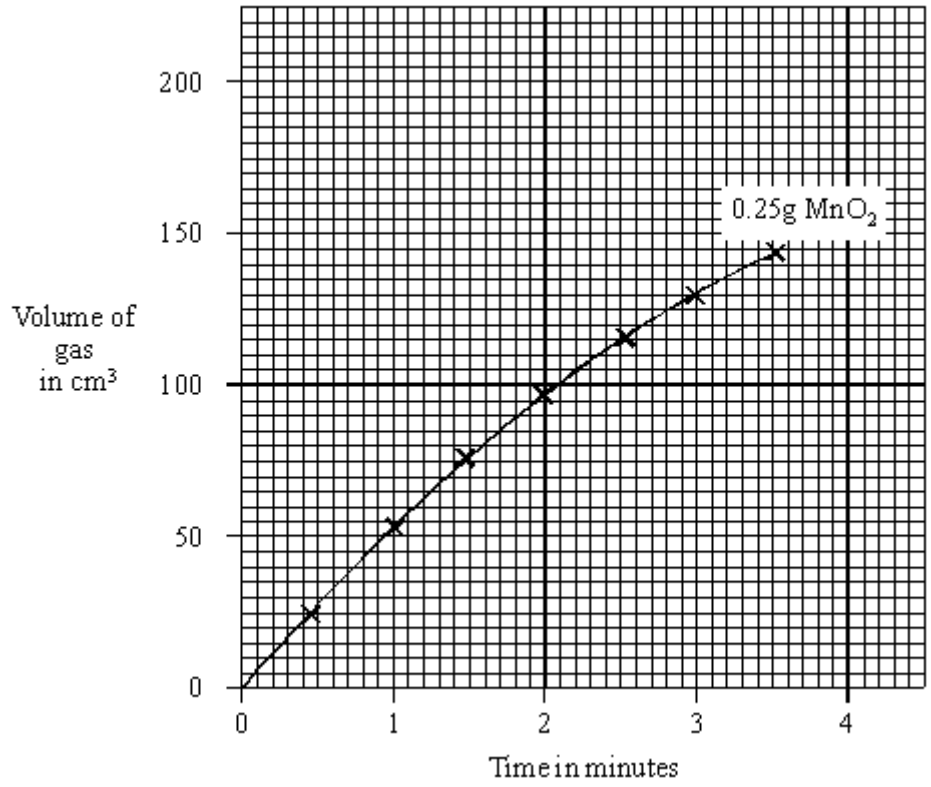


(2)

(ii) The results are shown in the table.

Time in minutes	0	0.5	1	1.5	2	2.5	3	3.5
Volume of gas in cm^3 using 0.25 g MnO_2	0	29	55	77	98	116	132	144
Volume of gas in cm^3 using 2.5 g MnO_2	0	45	84	118	145	162	174	182

Draw a graph of these results. The graph for 0.25 g MnO_2 has been drawn for you.



(3)

(iii) Explain why the slopes of the graphs become less steep during the reaction.

_____

_____

_____

(2)

(iv) The same volume and concentration of hydrogen peroxide solution was used for both experiments. What **two** other factors must be kept the same to make it a fair test?

1. _____

_____

2. _____

_____

(2)

(Total 15 marks)

Q30.

Acids and bases are commonly found around the home.

(a) Baking powder contains sodium hydrogencarbonate mixed with an acid.

(i) When water is added, the baking powder releases carbon dioxide. How could you test the gas to show that it is carbon dioxide?

Test _____

Result of test _____

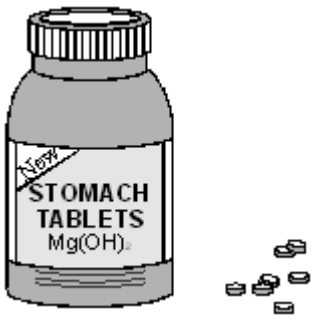
(2)

(ii) Complete and balance the chemical equation for the reaction of sodium hydrogencarbonate with sulphuric acid.

$NaHCO_3$ + H_2SO_4 → _____ + _____ + _____

(2)

(b) Indigestion tablets contain bases which cure indigestion by neutralising excess stomach acid.



(i) One type of indigestion tablet contains magnesium hydroxide. This base neutralises stomach acid as shown by the balanced chemical equation.

$Mg(OH)_2$ + 2HCl → $MgCl_2$ + $2H_2O$

Write a balanced **ionic** equation for the neutralisation reaction.

_____

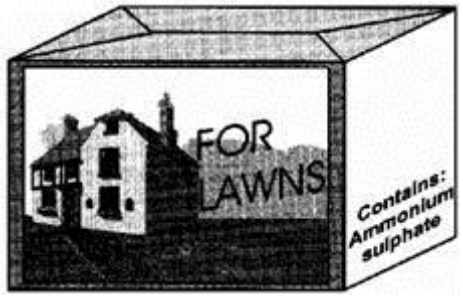
(2)

(ii) How does the pH in the stomach change after taking the tablets?

_____

(1)

(c) Ammonium sulphate is used as a lawn fertiliser.



Using ammonia solution, describe how you would make the fertiliser ammonium sulphate.

_____

_____

_____

_____

_____

_____

_____

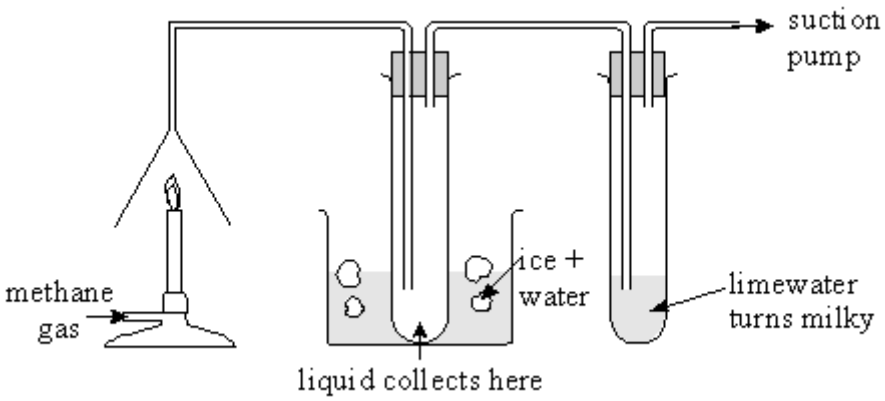
_____

(3)

(Total 10 marks)

Q31.

Methane CH_4 contains the elements carbon and hydrogen only. A student wanted to find out which new substances are produced when methane is burned. The student set up the apparatus shown below.



(a) Which gas in the air reacts with methane when it burns?

_____

(1)

(b) Name the liquid collected.

_____

(1)

(c) Name the gas which turns limewater milky.

_____

(1)

(d) When methane burns an exothermic reaction takes place. What is meant by an exothermic reaction?

_____

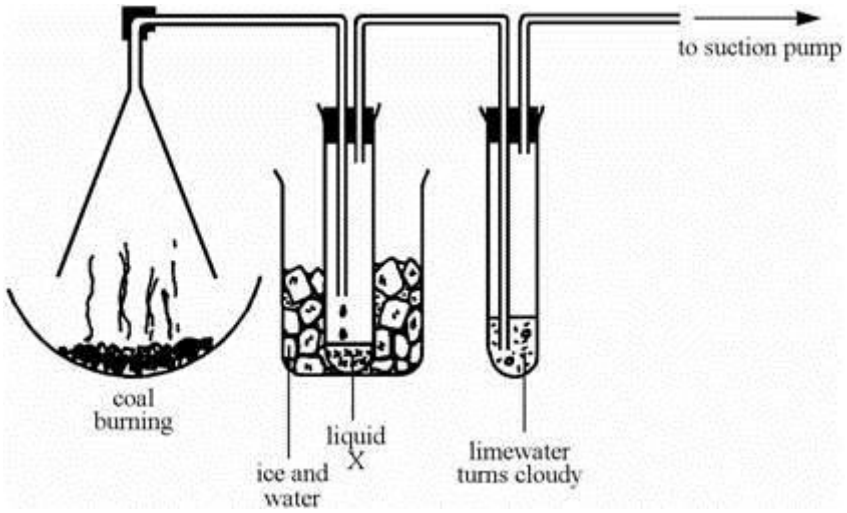
_____

(2)

(Total 5 marks)

Q32.

The gases produced when coal burns are cooled by ice and then bubbled through limewater.



(a) Complete these sentences.

(i) The coal is reacting with _____ when it burns.

(ii) During burning, elements in the coal are converted to compounds called _____

(2)

(b) Choose words from this list to complete the sentences.

carbon **carbon dioxide** **sulphur** **sulphur dioxide** **sodium** **water**

(i) Liquid X is a compound made from hydrogen and oxygen.

It is called _____

(ii) Sulphur dioxide is an acidic gas. It is given off when coal burns, because coal contains the element _____

(iii) Most fuels are compounds of hydrogen and _____

(3)

(c) Burning coal is an exothermic reaction.

Explain what "exothermic" means.

_____

_____

(1)

(d) (i) Which gas turns limewater cloudy?

_____

(ii) Which element in the coal is oxidised to form this gas?

_____

(2)

(Total 8 marks)

Q33.

Choose words from this list to complete the sentences,

ammonia	**carbon dioxide**	**hydrogen**	**nitrogen**
electrical	**heat**	**solar**	**sound**

(a) In air, the two most common gases are oxygen and _____ .

(b) When natural gas burns, energy is released mainly as _____ .

(c) When natural gas burns, a gas is produced which turns limewater milky.

The gas is _____ .

(Total 3 marks)