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| Centre Number | | | | | | Candidate Number | | | | |
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |



General Certificate of Secondary Education
Foundation Tier and Higher Tier
March 2011

Science A

Unit Chemistry C1a (Products from Rocks)

Chemistry

Unit Chemistry C1a (Products from Rocks)

CHY1AP
F&H

Wednesday 2 March 2011 Morning Session

For this paper you must have:

- a black ball-point pen
- an objective test answer sheet.

You may use a calculator.

Time allowed

- 30 minutes

Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Chemistry Unit 1a' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown.
- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown.
- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown.

1 2 3 4
○ ● ○ ○

1 2 3 4
○ ⊗ ○ ●

1 2 3 4
○ ⊗ ○ ⊗

Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

Section One

Questions **ONE** to **FIVE**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about uses of metals.

Match metals, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** Aluminium
- B** Calcium
- C** Copper
- D** Iron

| | |
|----------|--|
| 1 | When alloyed with carbon, this metal can form a hard steel. |
| 2 | Water pipes in the home are usually made from this metal. |
| 3 | Drinks cans are made from this metal because it does not easily corrode. |
| 4 | A carbonate of this metal is used to make quicklime. |

QUESTION TWO

Statements **A**, **B**, **C** and **D**, were made during a local planning enquiry for a new limestone quarry. The quarry will be in an area of outstanding natural beauty.

Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** Quarrying leads to loss of habitat plus increased noise and dust pollution.
- B** Quarrying provides much needed jobs.
- C** Quarrying satisfies society's need for limestone and its products.
- D** Lakes, climbing walls and picnic areas can be created when the quarry closes.

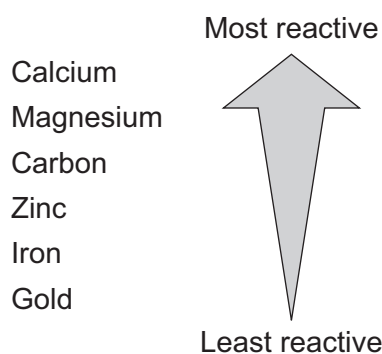
| | |
|----------|---|
| 1 | provides recreation for future generations |
| 2 | maintains the supply of limestone |
| 3 | be of immediate benefit to the local people |
| 4 | be harmful to wildlife in the area |

Turn over for the next question

Turn over ►

QUESTION THREE

This is the order of reactivity for some elements.



Match elements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** Carbon
B Gold
C Magnesium
D Zinc

| | |
|----------|---|
| 1 | It is a non-metal element. |
| 2 | It does not react with oxygen or water even at high temperatures. |
| 3 | It is more reactive than iron but can be extracted from its oxide by mixing with carbon and heating the mixture. |
| 4 | It is less reactive than calcium but cannot be extracted from its oxide by mixing with carbon and heating the mixture. |

QUESTION FOUR

This question is about four alkanes, **A**, **B**, **C** and **D**.

The general formula for the alkanes is $C_nH_{(2n+2)}$

| | Name of alkane | Number of carbon atoms in each molecule | Boiling point in °C |
|----------|----------------|---|---------------------|
| A | Ethane | 2 | -89 |
| B | Pentane | 5 | +36 |
| C | Hexane | 6 | +69 |
| D | Dodecane | 12 | +216 |

Match alkanes, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table below.

| | |
|----------|--|
| 1 | It has the lowest boiling point. |
| 2 | It has the largest molecules. |
| 3 | It has 12 hydrogen atoms in each molecule. |
| 4 | It has a total of 20 atoms in each molecule. |

Turn over for the next question

Turn over ►

QUESTION FIVE

This question is about substances that burn in air and the gases they produce.

Match substances, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A Carbon monoxide (CO)

B Hydrogen (H₂)

C Methane (CH₄)

D Hydrogen sulfide (H₂S)

| | Gases produced when the substance burns in air |
|----------|---|
| 1 | carbon dioxide (CO ₂) and water vapour (H ₂ O) |
| 2 | water vapour (H ₂ O) only |
| 3 | water vapour (H ₂ O) and sulfur dioxide (SO ₂) |
| 4 | carbon dioxide (CO ₂) only |

Turn over for the next question

Turn over ►

Section TwoQuestions **SIX** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION SIX

A man is going to make a concrete base for his garage.

He does an investigation to find out the ratio of sand to cement that will produce the strongest concrete:

- He makes several mixtures, changing the ratio of sand to cement.
- He measures the sand and cement quantities using a trowel.
- He makes a block of concrete with the same amount of each of the different mixtures.
- He makes the blocks exactly the same size.
- He drops a metal ball, from a measured height, onto each of the concrete blocks.
- He observes the concrete to see if it breaks.

The man starts by dropping the metal ball from a height of 10 cm onto one of the blocks. He gradually increases the height until the block breaks. He records this height.

He repeats this process with each of the concrete blocks.

The results are shown in the table below.

| Trowels of sand | Trowels of cement | Height in cm |
|-----------------|-------------------|--------------|
| 8 | 1 | 18 |
| 7 | 1 | 24 |
| 6 | 1 | 30 |
| 5 | 1 | 36 |
| 4 | 1 | 37 |
| 3 | 1 | 41 |
| 2 | 1 | 45 |

6A The independent variable in this test is the . . .

- 1 size of the concrete blocks.
- 2 ratio of sand to cement.
- 3 type of metal ball dropped.
- 4 height from which the metal ball is dropped.

6B The man is not confident that the height readings of 36 cm and 37 cm are correct.

What should he do?

- 1 repeat all the measurements using a heavier metal ball
- 2 repeat the measurement for the 5:1 ratio of sand to cement
- 3 repeat the measurement for the 4:1 ratio of sand to cement
- 4 repeat the measurements for the 5:1 and 4:1 ratios of sand to cement

6C The results in the table show a pattern.

The pattern is that . . .

- 1 as the ratio of sand to cement decreases, the strength of the concrete increases.
- 2 as the quantity of sand increases, the strength of the concrete increases.
- 3 as the quantity of sand decreases, the concrete breaks at a lower height.
- 4 the strength of the concrete is directly proportional to the quantity of sand added.

6D How could the man obtain results that are more reliable?

- 1 use different types of cement
- 2 weigh out the sand with a balance
- 3 repeat the test for all mixtures and calculate the mean
- 4 add stones to some of the concrete mixtures

Turn over ►

QUESTION SEVEN

During December 1952, many people died in London due to smog. Smog is a mixture of smoke and sulfur dioxide.

7A Sulfur dioxide is responsible for . . .

- 1 global dimming.
- 2 global warming.
- 3 the greenhouse effect.
- 4 acid rain.

The table shows the amount of sulfur dioxide in the air in three places in London in December 1952.

| Amount of sulfur dioxide in parts per million | | | | | | | | |
|---|---|--|------|------|------|------|------|------|
| Location within London | Mean for the whole month of December 1952 | Reading on each day in first week of December 1952 | | | | | | |
| | | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th |
| Lambeth | 0.22 | 0.16 | 0.24 | 0.34 | 0.75 | 0.86 | 1.34 | 0.47 |
| Southwark | 0.11 | 0.19 | 0.26 | 0.38 | 0.41 | 1.14 | 0.95 | 0.80 |
| Westminster | 0.16 | 0.15 | – | 0.24 | 0.48 | 0.63 | 0.99 | 0.89 |

7B Which of the following statements describes the pattern of the readings in the table?

- 1 The highest reading for sulfur dioxide is on the same day in each location.
- 2 The readings all rise and then fall in each location.
- 3 The sulfur dioxide readings are the same on the 6th December in each location.
- 4 The readings all rise and then stay the same in each location.

7C The most likely value for the missing reading on the 2nd December for Westminster is . . .

- 1 0.13
- 2 0.19
- 3 0.36
- 4 0.45

7D The mean value for the whole month of December for Southwark is lower than any of the readings for the first 7 days of December for Southwark.

This is because for Southwark, . . .

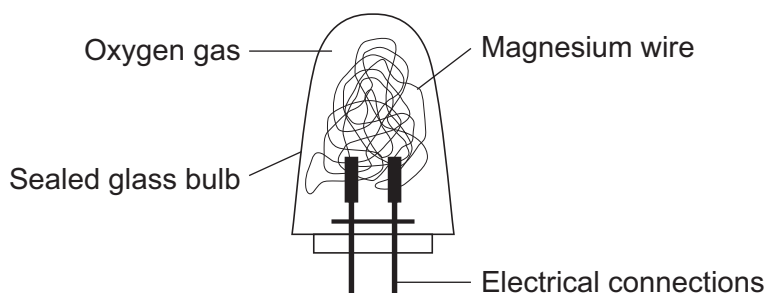
- 1 the mean of the readings for the first 7 days in December is 0.11
- 2 the readings for the other days in December were all zero.
- 3 after 7th December, the smog became thicker.
- 4 most of the readings for the other days in December were lower than 0.11

Turn over for the next question

Turn over ►

QUESTION EIGHT

The diagram shows a flash bulb that was used in photography.



When a photograph is taken, an electric current flows through the magnesium. The magnesium burns very brightly and very quickly. A white powder called magnesium oxide (MgO) is formed.

A student wanted to find out if the mass of the flash bulb changed when it was used.

- The mass of a new flash bulb was measured.
- It was made to flash and then allowed to cool.
- The glass bulb was unbroken.
- The mass of the used flash bulb was then measured.

8A Which of the following statements is correct?

The mass of the flash bulb . . .

- 1 did not change.
- 2 changed because a chemical reaction had taken place.
- 3 increased because a new substance had been made.
- 4 decreased because the magnesium and oxygen had been used up.

8B Which statement correctly describes what happens inside the flash bulb?

- 1 Magnesium and oxygen atoms make magnesium oxide when they mix together.
- 2 Magnesium and oxygen atoms combine and are held together by chemical bonds.
- 3 Many new magnesium and oxygen atoms are formed when there is a flash inside the flash bulb.
- 4 Magnesium and oxygen atoms combine to make atoms of magnesium oxide.

- 8C** Which row in the table gives a correct description of each substance involved in the reaction in the flash bulb?

| | Substance | | |
|----------|-----------|----------|-----------------|
| | Magnesium | Oxygen | Magnesium oxide |
| 1 | element | element | compound |
| 2 | element | compound | element |
| 3 | compound | compound | element |
| 4 | element | compound | compound |

- 8D** The magnesium oxide made in this reaction can be used to produce magnesium nitrate. The formula for magnesium nitrate is $\text{Mg}(\text{NO}_3)_2$

Which row in the table below shows the numbers of each type of atom in the formula $\text{Mg}(\text{NO}_3)_2$?

| | Magnesium | Nitrogen | Oxygen |
|----------|-----------|----------|--------|
| 1 | 1 | 1 | 3 |
| 2 | 2 | 1 | 6 |
| 3 | 1 | 2 | 3 |
| 4 | 1 | 2 | 6 |

Turn over for the next question

Turn over ►

QUESTION NINE

This question is about the extraction and recycling of copper.

Copper is used in its pure form or mixed with other metals.

Large amounts of scrap copper metal from a variety of sources can easily be recycled by re-melting.

9A Pure copper can be extracted directly by . . .

- 1 thermal decomposition of copper carbonate.
- 2 thermal decomposition of copper oxide.
- 3 carbon reduction of copper oxide in a blast furnace.
- 4 electrolysis of copper compounds dissolved in water.

9B Small amounts of other metals are sometimes added to copper to produce . . .

- 1 compounds that conduct electricity better.
- 2 compounds that are softer.
- 3 alloys that are harder.
- 4 new elements that are harder.

9C The price of copper would increase if there was . . .

- 1 a decrease in the demand for copper.
- 2 an increase in energy costs.
- 3 an increase in the amount of copper being recycled.
- 4 a discovery of a low grade copper ore in a remote area of the world.

9D One **disadvantage** of recycling copper is that it . . .

- 1 prevents heaps of scrap metal from building up.
- 2 still requires the use of energy resources.
- 3 will increase the price of copper.
- 4 will contaminate the world's supplies of copper.

END OF TEST

There are no questions printed on this page

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

Section One

Questions **ONE** and **TWO**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about substances that burn in air and the gases they produce.

Match substances, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** Carbon monoxide (CO)
- B** Hydrogen (H₂)
- C** Methane (CH₄)
- D** Hydrogen sulfide (H₂S)

| | Gases produced when the substance burns in air |
|----------|---|
| 1 | carbon dioxide (CO ₂) and water vapour (H ₂ O) |
| 2 | water vapour (H ₂ O) only |
| 3 | water vapour (H ₂ O) and sulfur dioxide (SO ₂) |
| 4 | carbon dioxide (CO ₂) only |

QUESTION TWO

This question is about the positions of four metals in the reactivity series.

- Only metal **C** can be extracted by heating the metal oxide in hydrogen.
- Only metals **B** and **C** can be extracted by mixing their oxides with carbon and heating strongly.
- When the oxide of metal **A** is mixed with metal **D** and heated, metal **A** is produced.

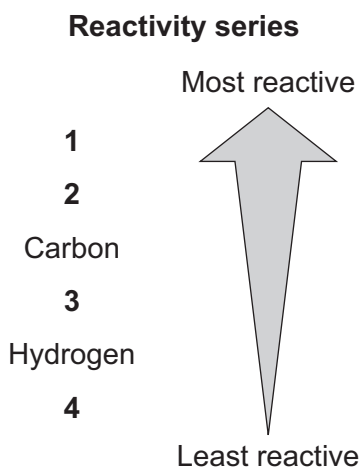
Match metals, **A**, **B**, **C** and **D**, with the numbers **1–4** in the reactivity series.

A Metal **A**

B Metal **B**

C Metal **C**

D Metal **D**



Turn over for the next question

Turn over ►

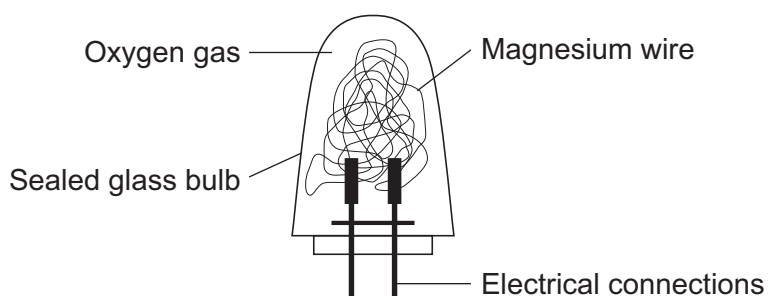
Section TwoQuestions **THREE** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION THREE

The diagram shows a flash bulb that was used in photography.



When a photograph is taken, an electric current flows through the magnesium. The magnesium burns very brightly and very quickly. A white powder called magnesium oxide (MgO) is formed.

A student wanted to find out if the mass of the flash bulb changed when it was used.

- The mass of a new flash bulb was measured.
- It was made to flash and then allowed to cool.
- The glass bulb was unbroken.
- The mass of the used flash bulb was then measured.

3A Which of the following statements is correct?

The mass of the flash bulb . . .

- 1 did not change.
- 2 changed because a chemical reaction had taken place.
- 3 increased because a new substance had been made.
- 4 decreased because the magnesium and oxygen had been used up.

3B Which statement correctly describes what happens inside the flash bulb?

- 1 Magnesium and oxygen atoms make magnesium oxide when they mix together.
- 2 Magnesium and oxygen atoms combine and are held together by chemical bonds.
- 3 Many new magnesium and oxygen atoms are formed when there is a flash inside the flash bulb.
- 4 Magnesium and oxygen atoms combine to make atoms of magnesium oxide.

3C Which row in the table gives a correct description of each substance involved in the reaction in the flash bulb?

| | Substance | | |
|----------|-----------|----------|-----------------|
| | Magnesium | Oxygen | Magnesium oxide |
| 1 | element | element | compound |
| 2 | element | compound | element |
| 3 | compound | compound | element |
| 4 | element | compound | compound |

3D The magnesium oxide made in this reaction can be used to produce magnesium nitrate. The formula for magnesium nitrate is $\text{Mg}(\text{NO}_3)_2$

Which row in the table below shows the numbers of each type of atom in the formula $\text{Mg}(\text{NO}_3)_2$?

| | Magnesium | Nitrogen | Oxygen |
|----------|-----------|----------|--------|
| 1 | 1 | 1 | 3 |
| 2 | 2 | 1 | 6 |
| 3 | 1 | 2 | 3 |
| 4 | 1 | 2 | 6 |

Turn over ►

QUESTION FOUR

This question is about the extraction and recycling of copper.

Copper is used in its pure form or mixed with other metals.

Large amounts of scrap copper metal from a variety of sources can easily be recycled by re-melting.

4A Pure copper can be extracted directly by . . .

- 1 thermal decomposition of copper carbonate.
- 2 thermal decomposition of copper oxide.
- 3 carbon reduction of copper oxide in a blast furnace.
- 4 electrolysis of copper compounds dissolved in water.

4B Small amounts of other metals are sometimes added to copper to produce . . .

- 1 compounds that conduct electricity better.
- 2 compounds that are softer.
- 3 alloys that are harder.
- 4 new elements that are harder.

4C The price of copper would increase if there was . . .

- 1 a decrease in the demand for copper.
- 2 an increase in energy costs.
- 3 an increase in the amount of copper being recycled.
- 4 a discovery of a low grade copper ore in a remote area of the world.

4D One **disadvantage** of recycling copper is that it . . .

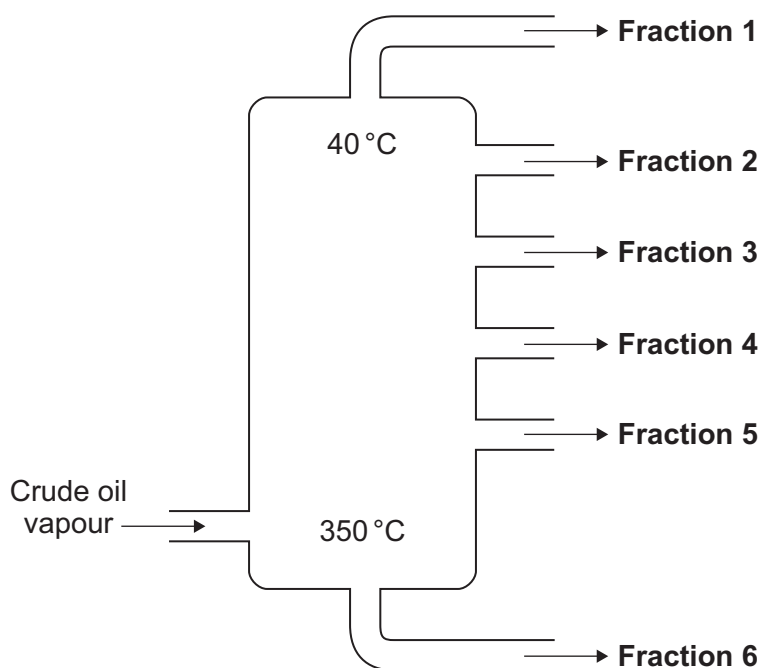
- 1 prevents heaps of scrap metal from building up.
- 2 still requires the use of energy resources.
- 3 will increase the price of copper.
- 4 will contaminate the world's supplies of copper.

Turn over for the next question

Turn over ►

QUESTION FIVE

Crude oil can be separated into fractions by fractional distillation.



5A The fractions can be separated in this way because the hydrocarbons in the crude oil . . .

- 1 have different chemical properties.
- 2 are compounds containing only two elements.
- 3 are gases, liquids and solids.
- 4 have different boiling points.

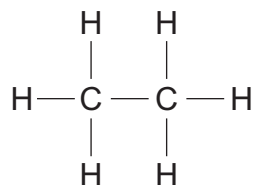
5B Each fraction will contain . . .

- 1 a single alkane.
- 2 alkanes with the same chemical formula.
- 3 a mixture of alkanes.
- 4 alkanes with the same number of carbon atoms in each molecule.

5C When compared with **Fraction 5**, **Fraction 3** . . .

- 1 will be more difficult to ignite.
- 2 will be more volatile.
- 3 will be more viscous.
- 4 will have boiling points in a higher range.

5D The diagram shows a molecule of an alkane.



In which fraction will most of this alkane be found?

- 1 **Fraction 1**
- 2 **Fraction 2**
- 3 **Fraction 4**
- 4 **Fraction 6**

Turn over for the next question

Turn over ►

QUESTION SIX

Alcohols have the general formula $C_nH_{2n+1}OH$

The OH group is known as the functional group for alcohols.

Alcohols with a value of 'n' less than 4 burn completely in air without producing any carbon particles.

Alcohols with a value of 'n' greater than 4 do not burn completely in air and produce carbon particles.

Some properties of alcohols are listed in the table.

| 'n' value of the alcohol | Melting point in °C | Boiling point in °C | Solubility in water |
|--------------------------|---------------------|---------------------|---------------------|
| 2 | -117 | 79 | Very soluble |
| 4 | -89 | 117 | Soluble |
| 6 | -47 | 158 | Slightly soluble |
| 8 | -17 | 195 | Insoluble |

6A Which of the following formulae represents the alcohol with a value of $n=4$?

- 1 C_4H_5OH
- 2 C_4H_8OH
- 3 C_4H_9OH
- 4 $C_4H_{10}OH$

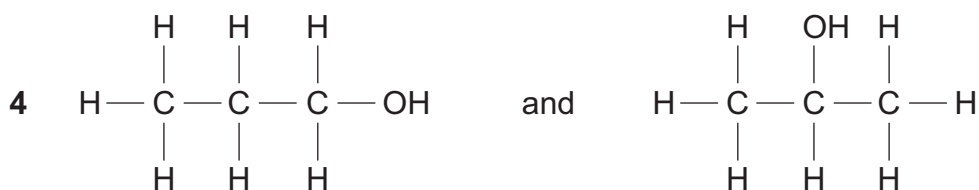
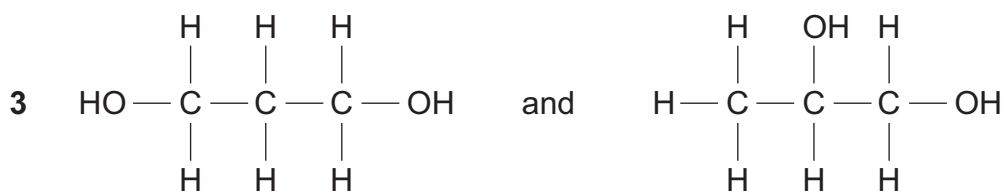
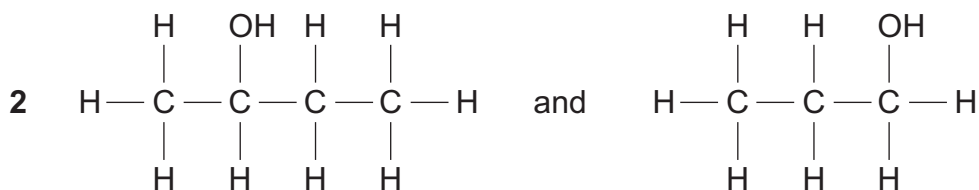
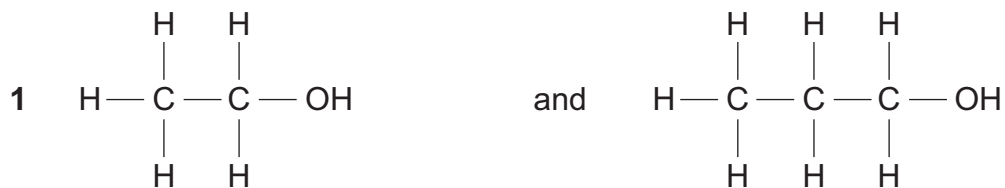
6B An alcohol has a value of $n=10$.

Which row in the table shows the likely properties of this alcohol?

| | Melting point in °C | Boiling point in °C | Solubility in water |
|----------|---------------------|---------------------|---------------------|
| 1 | 10 | 230 | Insoluble |
| 2 | -4 | 235 | Slightly soluble |
| 3 | 0 | 200 | Insoluble |
| 4 | 5 | 200 | Slightly soluble |

6C There are two possible structures for an alcohol with a value of $n=3$.

Which are the two correct structures?



6D What are the likely products from burning in air an alcohol with a value of $n=8$?

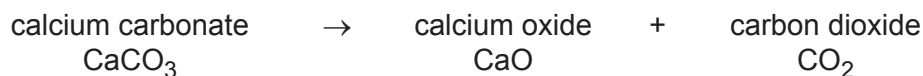
- 1 carbon dioxide and water only
- 2 carbon dioxide, carbon particles and water
- 3 carbon dioxide and carbon particles
- 4 carbon dioxide, sulfur dioxide and water

Turn over for the next question

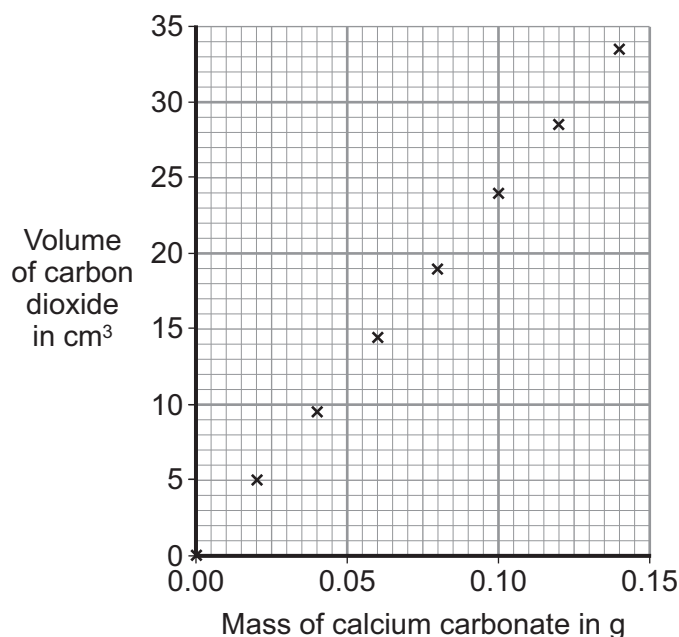
Turn over ►

QUESTION SEVEN

When calcium carbonate is heated it decomposes, forming calcium oxide and carbon dioxide.



A student investigated how the quantity of carbon dioxide produced varies with the quantity of calcium carbonate that decomposes. The graph shows the results of the investigation.



7A What conclusion can be correctly drawn from these results?

- 1 The volume of carbon dioxide is independent of the mass of calcium carbonate.
- 2 The volume of carbon dioxide is directly proportional to the mass of calcium carbonate.
- 3 The volume of carbon dioxide is indirectly proportional to the mass of calcium carbonate.
- 4 There is no relationship between the volume of carbon dioxide and the mass of calcium carbonate.

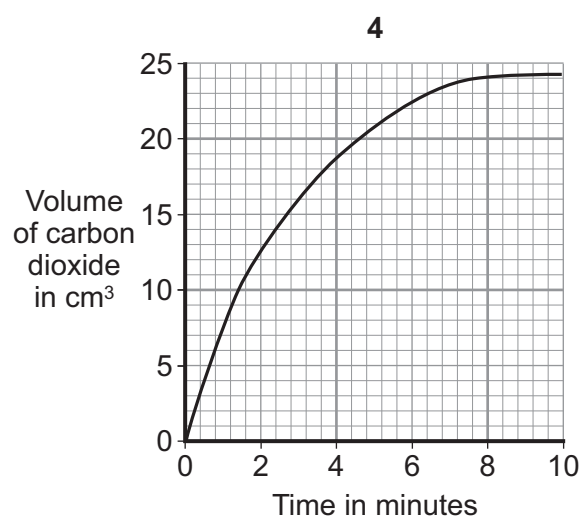
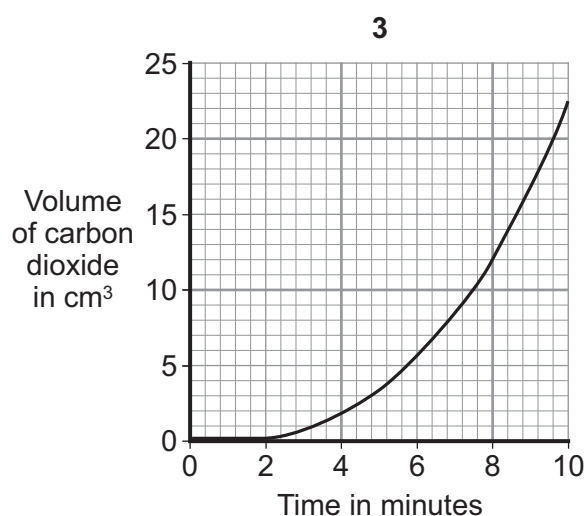
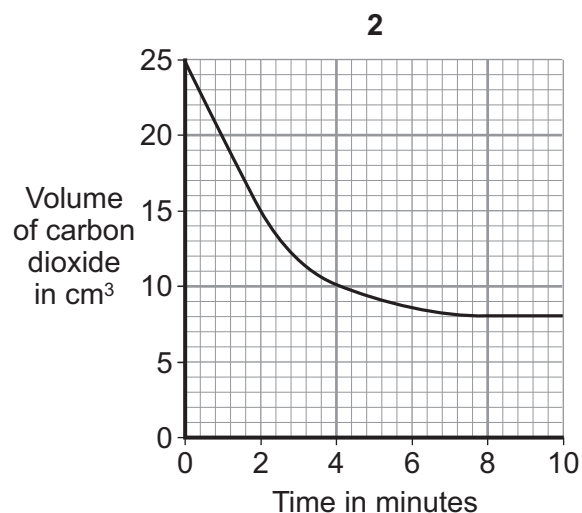
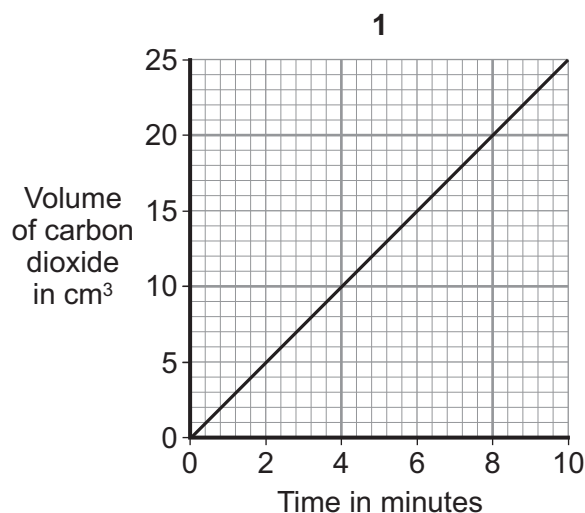
7B The student repeated the investigation using the same masses of an impure sample of calcium carbonate. This sample contained 10% of a substance that did not decompose on heating.

Which one of the following would describe the graph obtained?

- 1 a straight line that then levels off at just over 0.1 g of calcium carbonate
- 2 a straight line that has a gradient that is 10% steeper throughout the whole range
- 3 a curved line that increases by 10% for each point on the graph
- 4 a straight line with a gradient that is less than the original sample

- 7C** The student repeated the first experiment using 0.1 g of calcium carbonate and measured the volume of carbon dioxide produced every minute until the reaction had finished.

Which of the following graphs could the student's results produce?



- 7D** 5.0 grams of sodium carbonate were heated in a Bunsen burner flame.

There was no loss in mass after heating for 3 minutes.

A correct conclusion that can be drawn from this information is that . . .

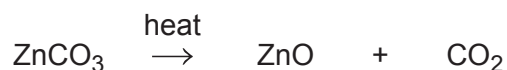
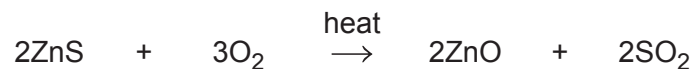
- 1 sodium carbonate would decompose if heated for longer than 3 minutes.
- 2 sodium carbonate decomposes only at higher temperatures.
- 3 the mass of sodium oxide produced was equal to the mass of sodium carbonate heated.
- 4 sodium carbonate does **not** decompose at Bunsen burner temperatures.

Turn over ►

QUESTION EIGHT

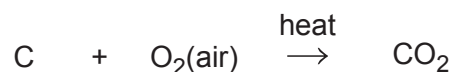
Zinc is a reactive metal that will react with oxygen at high temperatures. Its two main ores are zinc sulfide (ZnS) and zinc carbonate (ZnCO₃). The relative abundance of each ore is about the same throughout the world.

To extract zinc, the ores are first heated to produce zinc oxide:

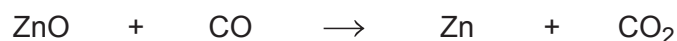


The zinc oxide is mixed with carbon (C) and heated in a furnace.

In the furnace, these reactions occur:



Zinc is extracted by the following reaction:



8A An advantage of using zinc carbonate instead of zinc sulfide is that. . .

- 1 zinc carbonate is more common and therefore cheaper.
- 2 only one waste product is formed.
- 3 less zinc is lost during the reaction.
- 4 zinc is formed directly without another chemical being used.

8B The atmosphere inside the furnace is kept rich in carbon monoxide (CO).

This is to . . .

- 1 prevent zinc oxide from reacting with carbon (C).
- 2 stop the zinc from re-forming zinc oxide.
- 3 remove carbon (C) from the furnace.
- 4 make carbon dioxide (CO₂).

- 8C** Zinc ores also contain lead compounds. Lead is produced with the zinc in the furnace. The temperature inside the furnace is about 1500 °C.

| | Boiling point in °C | Density in g per cm³ | Reactivity |
|-------------|----------------------------|--|-------------------|
| Lead | 1749 | 11.3 | Low |
| Zinc | 907 | 7.1 | High |

Pure zinc is obtained from the furnace because . . .

- 1 zinc leaves the furnace as vapour, and liquid lead remains in the furnace.
- 2 liquid zinc floats on liquid lead in the furnace.
- 3 lead leaves the furnace as vapour, and liquid zinc remains in the furnace.
- 4 lead is more reactive than zinc and reacts with oxygen to form lead oxide.

- 8D** Limestone is added to the furnace because . . .

- 1 it provides energy for the reaction.
- 2 it removes any acidic impurities.
- 3 it is the only source of the carbon dioxide in the furnace.
- 4 it is thermally stable.

Turn over for the next question

Turn over ►

QUESTION NINE

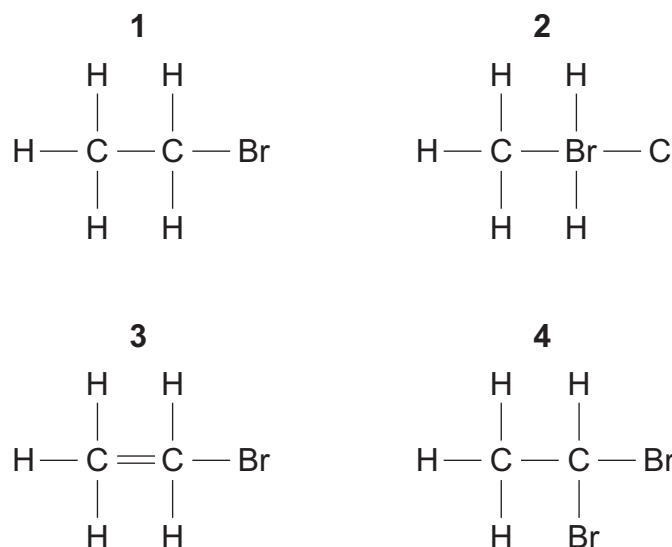
Haloalkanes are alkanes which have one or more hydrogen atoms replaced by halogen atoms.

The table shows properties of some haloalkanes.

| Haloalkane | Formula | Density in g per cm ³ | Boiling point in °C |
|------------------|------------------------------------|----------------------------------|---------------------|
| Chloromethane | CH ₃ Cl | 0.916 | - 24.1 |
| Bromomethane | CH ₃ Br | 1.676 | 3.7 |
| Iodomethane | CH ₃ I | 2.279 | 42.5 |
| Chloroethane | CH ₃ CH ₂ Cl | 0.898 | 12.4 |
| Bromoethane | CH ₃ CH ₂ Br | 1.461 | 38.5 |
| Iodoethane | CH ₃ CH ₂ I | 1.936 | 72.4 |
| Dichloromethane | CH ₂ Cl ₂ | 1.30 | 40.1 |
| Trichloromethane | CHCl ₃ | 1.50 | 61.8 |

- 9A** From the information in the table, increasing the length of the carbon chain . . .
- 1 increases density but decreases boiling point.
 - 2 increases density and boiling point.
 - 3 decreases density but increases boiling point.
 - 4 decreases density and boiling point.
- 9B** From the information in the table, replacing more hydrogen atoms with halogen atoms causes . . .
- 1 no effect on the boiling point or the density.
 - 2 an increase in boiling point and density.
 - 3 an increase in boiling point only.
 - 4 an increase in density only.

9C Which is the correct structural formula for bromoethane?



9D The order of the halogens in Group 7 of the periodic table is shown.

| |
|----------------|
| Group 7 |
| Fluorine (F) |
| Chlorine (Cl) |
| Bromine (Br) |
| Iodine (I) |

Which row in the table below shows the properties that fluoromethane might have?

| | Density in g per cm ³ | Boiling point in °C |
|----------|----------------------------------|---------------------|
| 1 | 0.6 | 15 |
| 2 | 1.8 | -100 |
| 3 | 1.1 | -30 |
| 4 | 0.6 | -80 |

END OF TEST

There are no questions printed on this page