Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
June 2012

Additional Science CH2FP
Unit Chemistry C2

Chemistry F
Unit Chemistry C2

Thursday 24 May 2012 9.00 am to 10.00 am

For this paper you must have:
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 7(a) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 (a) The symbol equation for the decomposition of hydrogen peroxide is:

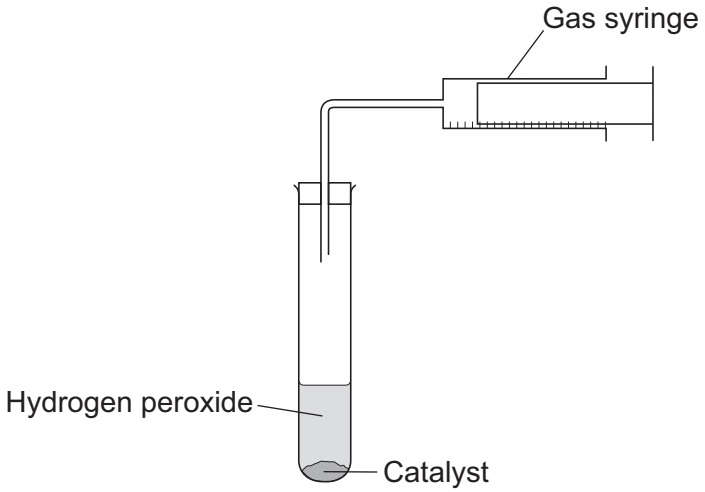
$$2H_2O_2 \rightarrow 2H_2O + O_2$$

Complete the word equation for the decomposition of hydrogen peroxide.

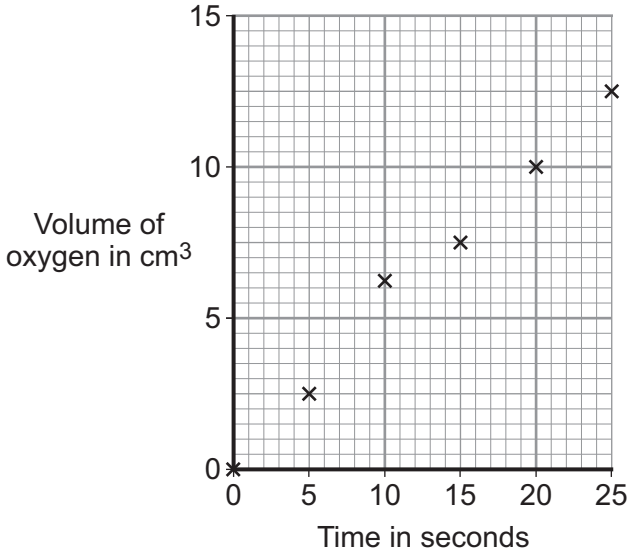
Hydrogen peroxide → ..... + ...

(1 mark)

1 (b) A student did an experiment to see how quickly hydrogen peroxide decomposes. The student used the apparatus shown below to measure the volume of oxygen.



1 (b) (i) Draw a straight line of best fit to complete the graph.



(1 mark)

1 (b) (ii) Draw a circle around the anomalous point on the graph.

(1 mark)

1 (b) (iii) What is the volume of oxygen given off after 15 seconds? ..... cm^3

(1 mark)

1 (b) (iv) How did the volume of oxygen change between 0 and 25 seconds?

.....

(1 mark)

1 (c) The student wanted to make the reaction faster.

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

1 (c) (i) To make the reaction faster, the temperature should be

higher.

lower.

the same.

(1 mark)

1 (c) (ii) To make the reaction faster, the hydrogen peroxide should be

more dilute.

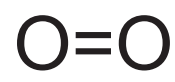
more concentrated.

the same.

(1 mark)

Question 1 continues on the next page

1 (d) The diagram represents the bonding in oxygen.



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

1 (d) (i) When two oxygen atoms bond, the atoms [share / transfer / delocalise] electrons.

(1 mark)

1 (d) (ii) The oxygen atoms are joined by [ionic / metallic / covalent] bonds.

(1 mark)

1 (d) (iii) Oxygen is made of [simple molecules. / a giant lattice. / macromolecules.]

(1 mark)

1 (e) When hydrogen peroxide decomposes water is produced.
Which **two** statements in the table explain why water is a liquid at room temperature?

Tick (✓) the **two** statements.

Statement	Tick (✓)
Water has a boiling point of 100 °C.	
Water is made of ions.	
Water has a melting point lower than room temperature.	
Water has a giant covalent structure.	

(2 marks)

12

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

2 Gold and gold ions are used as catalysts.

2 (a) An atom of gold is represented as:

$$^{197}_{79}Au$$

Complete the sentences.

The atomic number of gold is ..... .

The number of electrons in an atom of gold is ..... .

(2 marks)

2 (b) Scientists have found that gold nanoparticles are very good catalysts.

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

A gold nanoparticle contains a few | hundred / thousand / million | atoms.

(1 mark)

2 (c) The formation of a gold ion (Au^{3+}) from a gold atom (Au) is shown in the symbol equation.

$$Au \rightarrow Au^{3+} + 3e^-$$

2 (c) (i) Complete the sentence.

The particles lost when a gold atom becomes a gold ion

are called ..... .

(1 mark)

2 (c) (ii) Draw a ring around the correct answer to complete the sentence.

The number of these particles lost when a gold atom becomes a gold ion is | one. / two. / three. |

(1 mark)

2 (d) Gold ions are used as a catalyst in the reaction to make chloroethene.

How does a catalyst help a reaction?

.....

(1 mark)

2 (e) Chloroethene can react to make a thermosoftening polymer.

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

When heated, a thermosoftening polymer will

dissolve.

melt.

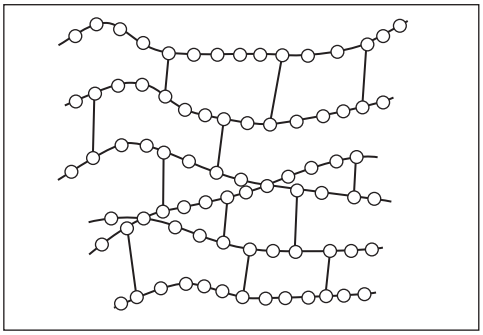
solidify.

(1 mark)

2 (e) (ii) Polymer **B** is a different type of polymer.

The diagram shows the structure of polymer **B**.

Polymer B



How can you tell from the diagram that polymer **B** is **not** thermosoftening?

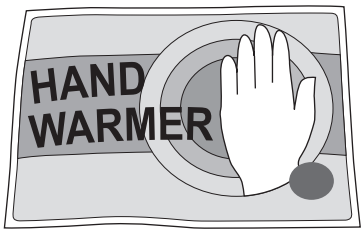
.....

.....

(1 mark)

8

3 Hand warmers use chemical reactions.



3 (a) The table shows temperature changes for chemical reactions **A**, **B** and **C**.

Reaction	Starting temperature in °C	Final temperature in °C	Change in temperature in °C
A	18	25	+ 7
B	17	.....	+ 5
C	18	27	+ 9

What is the final temperature for reaction **B**? Write your answer in the table.

(1 mark)

3 (b) (i) What name is given to reactions that heat the surroundings? .....

(1 mark)

3 (b) (ii) Which reaction, **A**, **B** or **C**, would be best to use in a hand warmer?

Reaction ☐

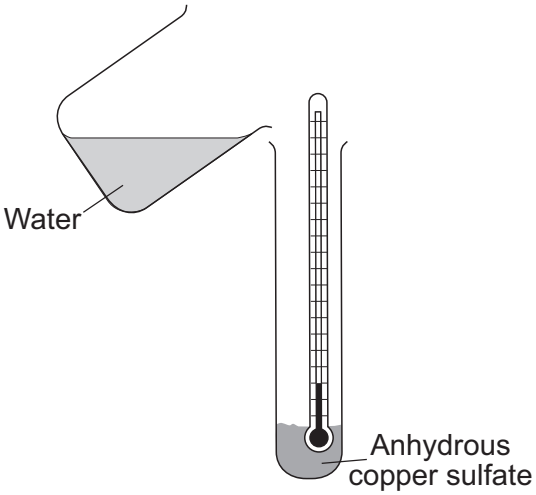
Give a reason why you chose this reaction.

.....

.....

(2 marks)

3 (c) A student added water to some anhydrous copper sulfate.



The equation for the reaction is shown.

anhydrous copper sulfate + water ⇌ hydrated copper sulfate

$$CuSO_4 + 5\ H_2O \rightleftharpoons CuSO_4.5H_2O$$

The student measured the temperature before and after the reaction.

3 (c) (i) The measurements showed that this reaction can be used for a hand warmer.

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

When water is added to anhydrous copper sulfate the temperature

of the mixture

- increases.
- decreases.
- stays the same.

(1 mark)

3 (c) (ii) Anhydrous copper sulfate is white.

What colour is seen after water is added to the anhydrous copper sulfate?

.....

(1 mark)

3 (c) (iii) What does the symbol ⇌ mean?

.....

(1 mark)

3 (c) (iv) The student heated a tube containing hydrated copper sulfate.

Name the solid substance produced.

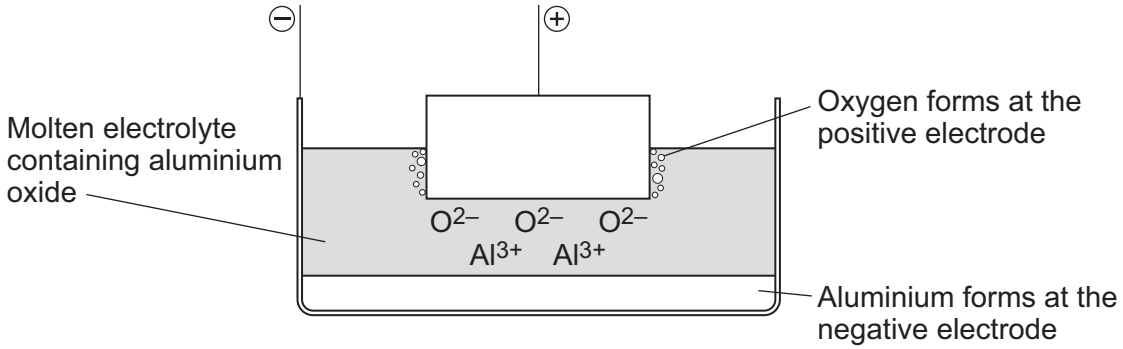
.....

(1 mark)

8

Turn over for the next question

4 The diagram represents an electrolysis cell for extracting aluminium.
The current will only flow when the electrolyte is molten.



4 (a) The electrolyte is aluminium oxide mixed with another substance.

4 (a) (i) What is the name of the other substance in the electrolyte?

Draw a ring around the correct answer.

cryolite **rock salt** **limestone**

(1 mark)

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

This other substance is added to

condense the aluminium oxide.

lower the melting point of the aluminium oxide.

raise the boiling point of the aluminium oxide.

(1 mark)

4 (b) (i) Oxide ions (O^{2-}) move to the positive electrode.

Explain why.

.....

.....

.....

.....

(2 marks)

4 (b) (ii) Oxygen is formed at the positive electrode. The oxygen then forms carbon dioxide.

The equation for the reaction is shown below.

$$C + O_2 \rightarrow CO_2$$

Complete the sentence.

The name of the element which reacts with oxygen is ..... .

(1 mark)

4 (b) (iii) The positive electrode gets smaller.

Suggest why.

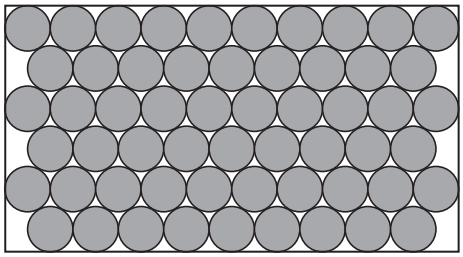
.....

.....

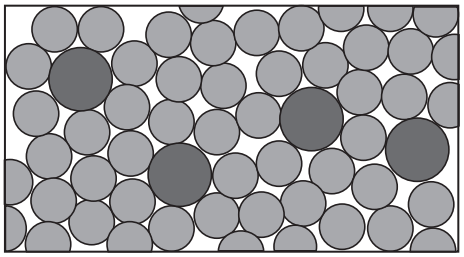
(1 mark)

4 (c) Aluminium is used in an alloy with magnesium to make drinks cans.

The diagrams show the arrangement of atoms in pure aluminium and in the alloy.



Pure aluminium



Alloy

The alloy is harder than pure aluminium.

Explain why. Use the diagrams to help you.

.....

.....

.....

.....

(2 marks)

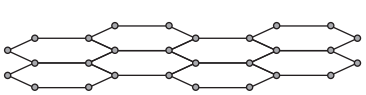
8

5 Read the information.

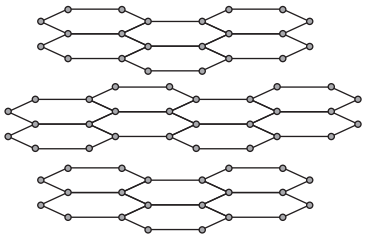
Graphene

Scientists have made a new substance called graphene.
The bonding and structure of graphene are similar to graphite.

Graphene is made of a single layer of the same atoms as graphite.



Graphene



Graphite

Use the information above and your knowledge of graphite to answer the questions.

5 (a) This part of the question is about graphene.

Choose the correct answer to complete each sentence.

5 (a) (i)

ionic	**covalent**	**metallic**

The bonds between the atoms in graphene are ..... .

(1 mark)

5 (a) (ii)

chromium	**carbon**	**chlorine**

Graphene is made of ..... atoms.

(1 mark)

5 (a) (iii)

2	**3**	**4**

In graphene each atom bonds to ..... other atoms.

(1 mark)

5 (b) This part of the question is about graphite.

Graphite is used in pencils.

Explain why. Use the diagrams to help you.

.....

.....

.....

.....

(2 marks)

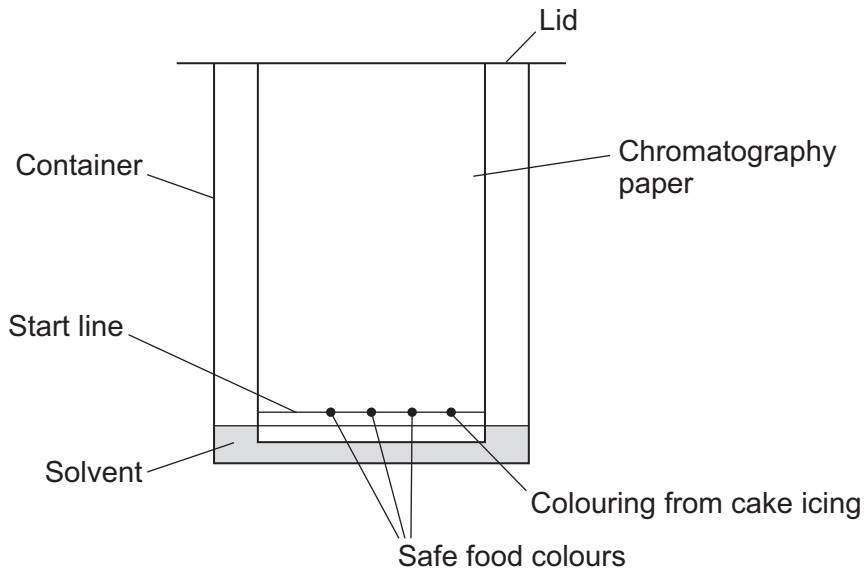
5

Turn over for the next question

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

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

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



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

.....

.....

(1 mark)

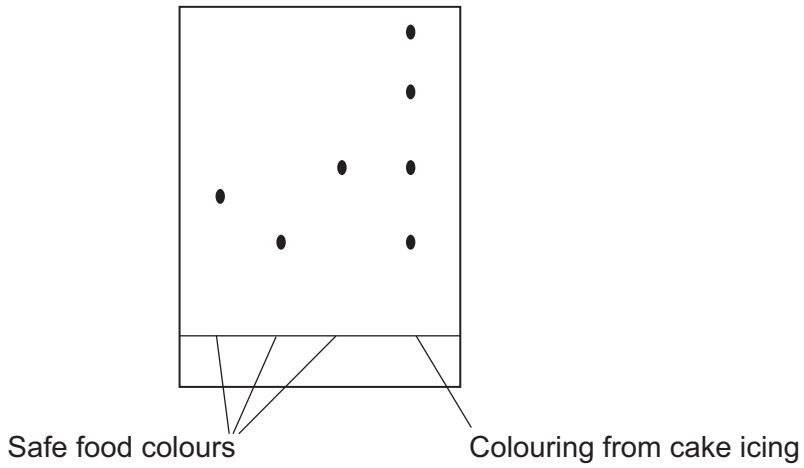
6 (a) (ii) The start line should be drawn in pencil **not** in ink.
Suggest why.

.....

.....

(1 mark)

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



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

.....

(1 mark)

6 (b) (ii) Is the cake icing safe to eat?

Give a reason for your answer.

.....

.....

(1 mark)

Question 6 continues on the next page

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

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

.....

.....

.....

.....

(2 marks)

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

.....

.....

(1 mark)

6 (c) (iii) What information does mass spectroscopy give?

.....

.....

(1 mark)

8

7 (a) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The salt called potassium chloride is made when potassium hydroxide solution reacts with hydrochloric acid.

potassium hydroxide solution + hydrochloric acid $\rightarrow$ potassium chloride solution + water

Describe a method for making **crystals** of potassium chloride from potassium hydroxide solution and hydrochloric acid.

In this method you should:

- describe how you will add the correct amount of the hydrochloric acid to neutralise the potassium hydroxide solution
- describe how you will get crystals of potassium chloride.

.....

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(6 marks)

Question 7 continues on the next page

7 (b) Ammonium nitrate is another salt.
Ammonium nitrate is made when ammonia solution is neutralised with an acid.

Name the acid to complete the word equation.

ammonia + ... acid → ammonium nitrate

(1 mark)

7 (c) Read the information.

Ammonium nitrate – good or bad?

Some farmers put a lot of ammonium nitrate on their farmland.

Many people are worried about this use of ammonium nitrate.

Rain water can wash the ammonium nitrate off the farmland and into rivers and lakes. The ammonium nitrate may get into drinking water supplies and could be harmful to health.

7 (c) (i) Why do some farmers put ammonium nitrate on their farmland?

.....

.....

(1 mark)

7 (c) (ii) Which **one** of the questions in the table cannot be answered by science alone?

Tick (✓) **one** question.

Question	Tick (✓)
How much ammonium nitrate is in drinking water?	
Should farmers stop using ammonium nitrate on their farmland?	
Is ammonium nitrate soluble in rain water?	

Give **two** reasons why this question **cannot** be answered by science alone.

.....

.....

.....

.....

(3 marks)

11

END OF QUESTIONS

There are no questions printed on this page

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