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 2011

Additional Science CHY2F
Unit Chemistry C2

Chemistry F
Unit Chemistry C2

Wednesday 25 May 2011 9.00 am to 9.45 am

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

You may use a calculator.

Time allowed
- 45 minutes

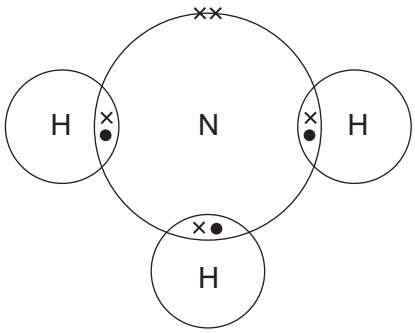
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work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

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

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

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

1 The diagram shows how the atoms are bonded in ammonia.



1 (a) Draw a ring around the correct answer.

1 (a) (i) The formula of an ammonia molecule is

NH^3 **N_3H** **NH_3**

(1 mark)

1 (a) (ii) The particles represented by the dots (•) and crosses (×) in the diagram are

electrons **neutrons** **protons**

(1 mark)

1 (a) (iii) The bonds between the nitrogen and hydrogen atoms in ammonia are

covalent **ionic** **metallic**

(1 mark)

1 (b) Ammonia is made by reacting nitrogen with hydrogen in the Haber process.
The equation for this reaction is shown below.

nitrogen + hydrogen $\rightleftharpoons$ ammonia

1 (b) (i) Use words from the box to complete the sentences.

air	**limestone**	**iron ore**	**natural gas**

Nitrogen is obtained from ..... .

Hydrogen is obtained from ..... .

(2 marks)

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

The symbol $\rightleftharpoons$ means that the reaction is

exothermic.

endothermic.

reversible.

(1 mark)

1 (b) (iii) A catalyst is used in the Haber process.

Draw a ring around the name of this catalyst.

iron **magnesium** **sodium**

(1 mark)

1 (c) Ammonium nitrate is a fertiliser that can be made by reacting ammonia with an acid.

Draw a ring around the name of the acid used in this reaction.

hydrochloric acid **nitric acid** **sulfuric acid**

(1 mark)

Question 1 continues on the next page

1 (d) Humberstone was a town in the desert of Northern Chile in South America. It was built for the people who worked in the nearby sodium nitrate mines.

The sodium nitrate was used as a fertiliser.

The sodium nitrate was exported by ship to countries all around the world.

Today the mines have closed and nobody lives in Humberstone.

One of the reasons for the mines closing was the invention of the Haber process.

Haber process factories can be built anywhere in the world.

1 (d) (i) How did the invention of the Haber process affect the people of Humberstone?

.....

.....

(1 mark)

1 (d) (ii) Suggest **two** advantages of making ammonium nitrate in the UK rather than importing sodium nitrate from Chile.

1 .....

.....

2 .....

.....

(2 marks)

11

2 The picture shows lumps of phosphate rock.

Phosphoric acid is made by reacting phosphate rock with sulfuric acid.

Only **three** of the methods shown below will **increase** the rate of this reaction.

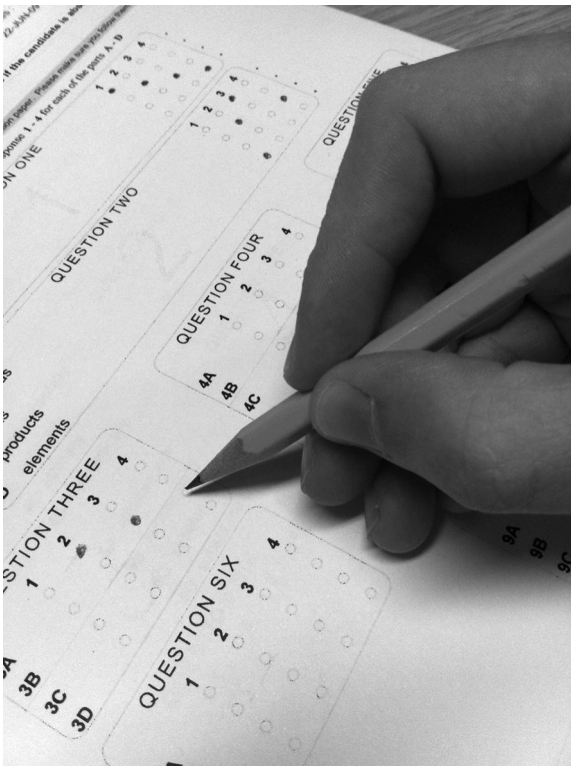
Put a **tick** (✓) next to each of the **three** methods that will **increase** the rate of this reaction.

Method	Tick (✓)
Use a more concentrated solution of sulfuric acid	
Use larger lumps of phosphate rock	
Cool the mixture of phosphate rock and sulfuric acid	
Grind the phosphate rock into a powder before adding the acid	
Increase the temperature of the sulfuric acid	
Dilute the sulfuric acid solution with water	

(3 marks)

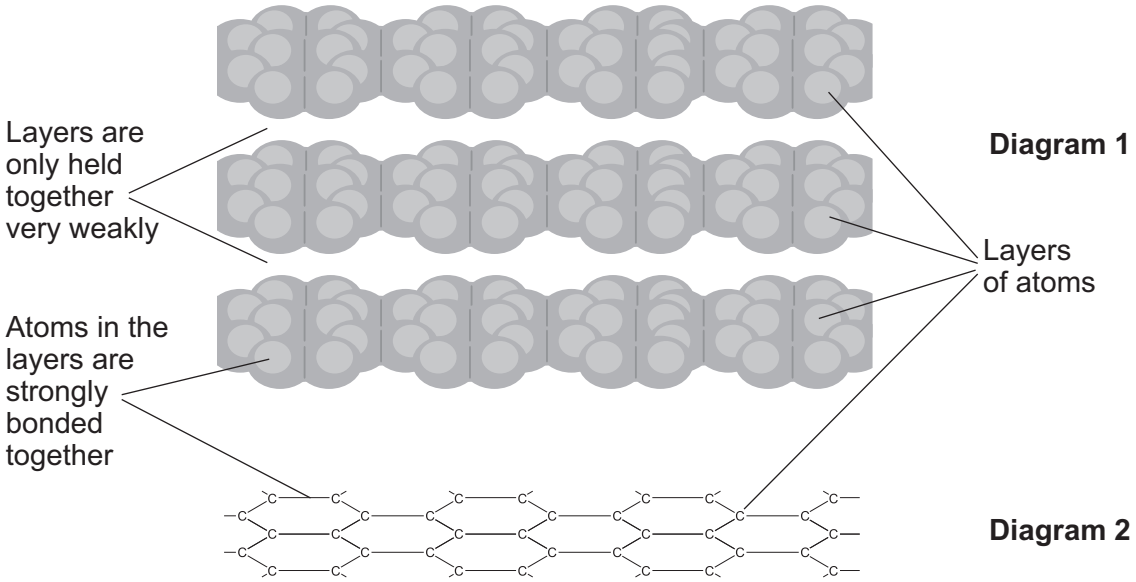
3

3 The picture shows a student using a pencil to complete a multiple choice answer sheet.



The pencil contains graphite. Graphite rubs off the pencil onto the paper.

Diagrams 1 and **2** show how the atoms are arranged in graphite.



3 (a) Use **Diagram 2** and your Data Sheet to help you to name the element from which graphite is made.

.....

(1 mark)

3 (b) Use **Diagram 1** to help you explain why graphite can rub off the pencil onto the paper.

.....

.....

.....

.....

(2 marks)

3 (c) Draw a ring around the type of bond which holds the atoms together in each layer.

covalent **ionic** **metallic**

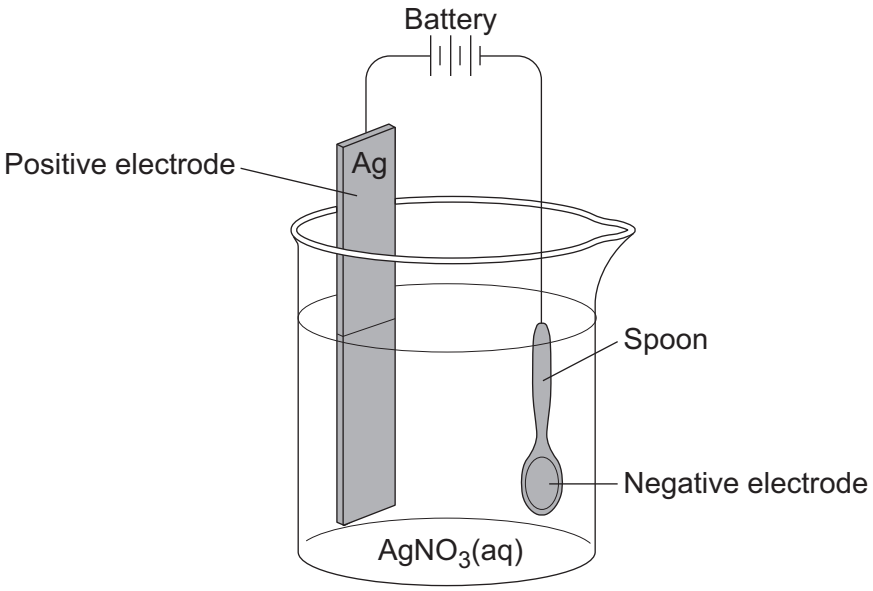
(1 mark)

4

Turn over for the next question

4 Electroplating is used to coat a cheap metal with a thin layer of an expensive metal.

In the diagram a teaspoon made of nickel is being coated with silver.



Silver nitrate, $AgNO_3$, contains silver ions (Ag^+) and nitrate ions (NO_3^-).

4 (a) Solid silver nitrate, $AgNO_3$(s), does **not** conduct electricity.

Choose the correct answer in the box to complete the sentence.

are too big	**cannot move**	**are too small**

Solid silver nitrate does **not** conduct electricity because the ions

..... .

(1 mark)

4 (b) What substance is added to $AgNO_3$(s) to turn it into $AgNO_3$(aq)?

Draw a ring around the correct answer.

petrol **alcohol** **water**

(1 mark)

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

4 (c) (i) Silver ions move to the negative electrode because they have

no charge.

a negative charge.

a positive charge.

(1 mark)

4 (c) (ii) When silver ions reach the negative electrode they turn into silver

atoms.

compounds.

molecules.

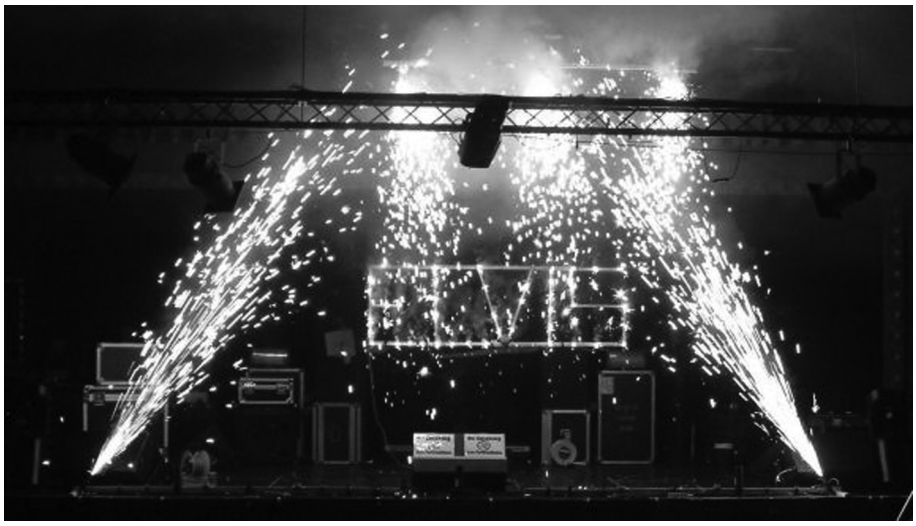
(1 mark)

4

Turn over for the next question

5 Read the information in the box.

Flash powder is used to produce special effects at pop concerts.



Flash powder contains aluminium. The powder burns with a bright white flame and gives out lots of heat and light. It also produces white smoke.

The flash powder is placed on stage in a special container. At the bottom of the container there is a thin piece of wire. When the flash is needed, electricity is passed through the wire. The wire gets hot and starts the aluminium burning.

5 (a) When aluminium burns the reaction is exothermic.

Give **one** piece of information from the box which shows that the reaction is exothermic.

.....

(1 mark)

5 (b) The hot wire provides energy to start the aluminium burning.

Draw a ring around the name given to the energy needed to start a chemical reaction.

activation energy **potential energy** **solar energy**

(1 mark)

5 (c) When aluminium burns it reacts with oxygen to make aluminium oxide.

Complete the word equation for this reaction.

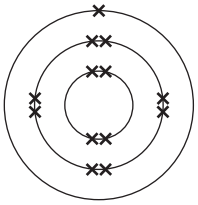
aluminium + ... → .....

(1 mark)

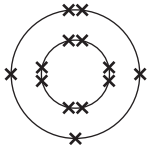
5 (d) An aluminium atom has 13 electrons.

Which diagram, **A, B** or **C**, represents the electronic structure of an aluminium atom?

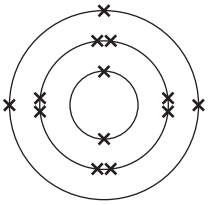
A



B



C



The electronic structure of an aluminium atom is diagram ☐

(1 mark)

5 (e) The white smoke produced is aluminium oxide.

Aluminium oxide contains aluminium ions (Al^{3+}) and oxide ions (O^{2-}).

Draw a ring around the correct word in each box to complete each sentence.

5 (e) (i) Electrons have [a negative / no / a positive] charge.

(1 mark)

5 (e) (ii) When an aluminium atom (Al) turns into an aluminium ion (Al^{3+})

it [gains / loses / shares] three electrons.

(1 mark)

5 (e) (iii) When an oxygen atom (O) turns into an oxide ion (O^{2-})

it [gains / loses / shares] [one / two / three] electrons.

(2 marks)

8

6 Read the article and then answer the questions.

TOXIC SOCKS?

Silver nanoparticles are added to the fibres used to make some socks. Silver has the special property that it can kill bacteria. As a result there are no unpleasant smells when wearing these socks.

Some scientists are concerned about the use of silver nanoparticles in socks.

The silver can be released from the socks when they are washed. This silver may end up in rivers. Silver in rivers may kill fish.

Scientists found that some makes of socks release the silver more easily than others. Socks in which the silver nanoparticles are trapped in the fibres released very little silver when washed.

6 (a) Suggest why silver stops unpleasant smells when wearing the socks.

.....

.....

(1 mark)

6 (b) How is the size of silver nanoparticles different from normal sized silver particles?

.....

(1 mark)

6 (c) The silver nanoparticles are more effective at preventing unpleasant smells than normal sized silver particles.

Suggest why.

.....

.....

(1 mark)

6 (d) The silver nanoparticles should be trapped in the sock fibres.

Use the information in the article to explain why.

.....

.....

.....

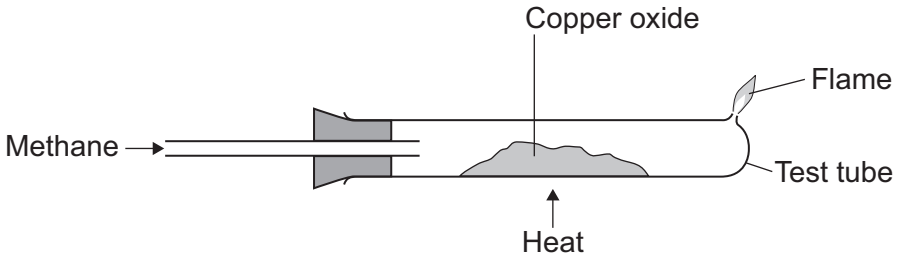
.....

(2 marks)

5

Turn over for the next question

7 An experiment was done on the reaction of copper oxide (CuO) with methane (CH_4).



7 (a) The equation for this reaction is shown below.

$$4CuO(s) + CH_4(g) \rightarrow 4Cu(s) + 2H_2O(g) + CO_2(g)$$

The water and carbon dioxide produced escapes from the test tube.

Use information from the equation to explain why.

.....

(1 mark)

7 (b) (i) Calculate the relative formula mass (M_r) of copper oxide (CuO).

Relative atomic masses (A_r): O = 16; Cu = 64.

.....

.....

.....

Relative formula mass (M_r) = ...

(2 marks)

7 (b) (ii) Calculate the percentage of copper in copper oxide.

.....

.....

.....

Percentage of copper = ... %

(2 marks)

7 (b) (iii) Calculate the mass of copper that could be made from 4.0 g of copper oxide.

.....

.....

Mass of copper = ... g

(1 mark)

7 (c) The experiment was done three times.
The mass of copper oxide used and the mass of copper made was measured each time.
The results are shown in the table.

	Experiment		
	1	**2**	**3**
Mass of copper oxide used in g	4.0	4.0	4.0
Mass of copper made in g	3.3	3.5	3.2

7 (c) (i) Calculate the mean mass of copper made in these experiments.

.....

.....

Mean mass of copper made = ... g

(1 mark)

7 (c) (ii) Suggest how the results of these experiments could be made more precise.

.....

.....

(1 mark)

7 (c) (iii) The three experiments gave slightly different results for the mass of copper made.
This was caused by experimental error.

Suggest **two** causes of experimental error in these experiments.

1 .....

.....

2 .....

.....

(2 marks)

10

END OF QUESTIONS

There are no questions printed on this page

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