

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
January 2009



ADDITIONAL SCIENCE
Unit Chemistry C2

CHY2F
F

CHEMISTRY
Unit Chemistry C2

Foundation Tier

Thursday 15 January 2009 1.30 pm to 2.15 pm

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a ruler • the Data Sheet (enclosed). <p>You may use a calculator.</p>
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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. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- 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.

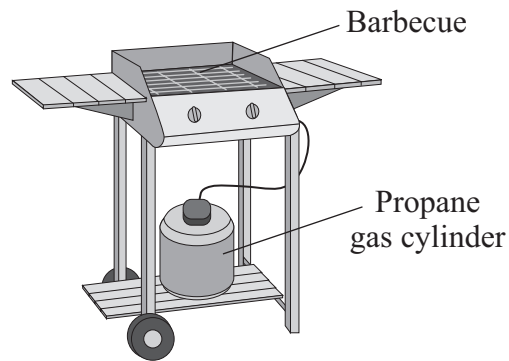
For Examiner's Use			
Question	Mark	Question	Mark
1		7	
2		8	
3		9	
4			
5			
6			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			



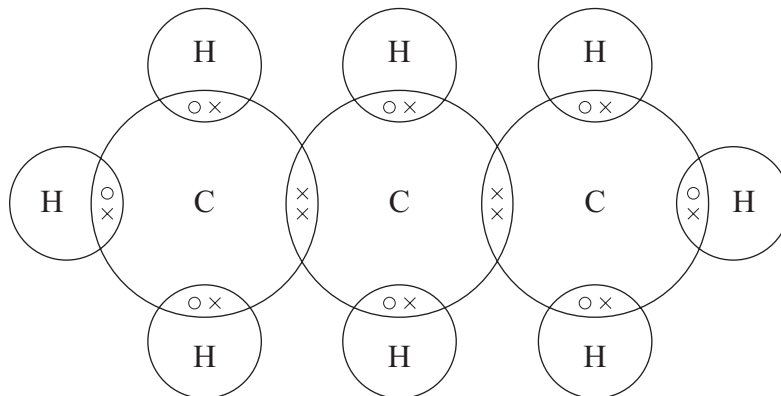
J A N O 9 C H Y 2 F 0 1

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

- 1 This barbecue burns propane gas.



The diagram represents a propane molecule.



- 1 (a) What is the formula of propane? (1 mark)

- 1 (b) (i) Draw a ring around the name of the particle represented by the symbols \circ and \times in the diagram.

electron

neutron

proton

(1 mark)



- 1 (b) (ii) Draw a ring around the type of bonding that holds the atoms together in a propane molecule.

covalent ionic metallic

(1 mark)

- 1 (c) Under high pressure in the cylinder propane is a liquid.
Liquid propane evaporates easily to form a gas when the tap on the cylinder is opened.

Draw a ring around the correct answer in each box to explain why propane evaporates easily.

Propane has a

high
low

 boiling point because it consists of

large
small

 molecules.

(1 mark)

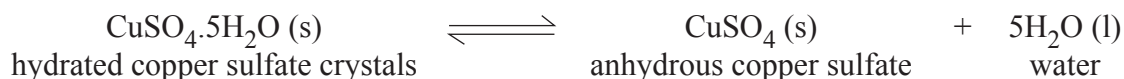
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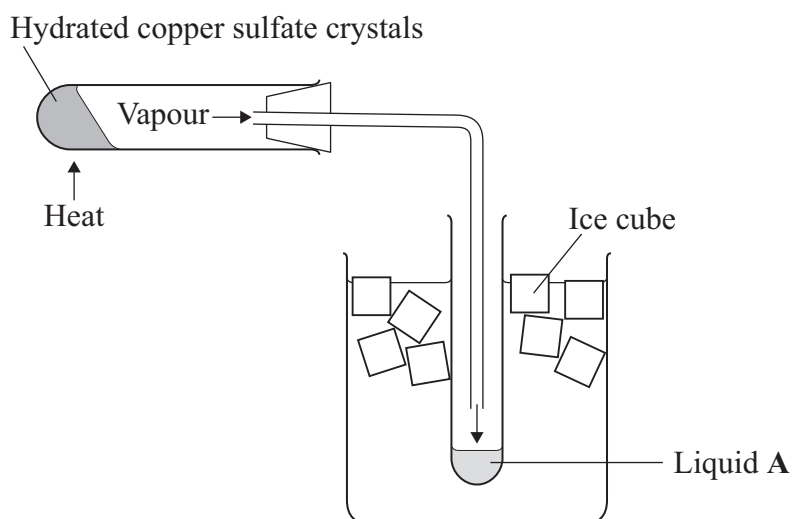
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- 2 A student heated some hydrated copper sulfate crystals.
The equation for this reaction is shown below.



The diagram shows the apparatus used.



- 2 (a) Name liquid A

(1 mark)

- 2 (b) What helped the vapour to condense into liquid A?

.....
.....

(1 mark)

- 2 (c) Put a tick (✓) next to the correct meaning of the symbol \rightleftharpoons

Meaning	(✓)
equal amounts of reactants and products	
exothermic reaction	
reversible reaction	

(1 mark)



- 2 (d) The student weighed the copper sulfate before and after it was heated. The experiment was repeated and the two sets of results are shown in the table.

Mass of copper sulfate before heating in grams	Mass of copper sulfate after heating in grams	Mass lost in grams
2.50	1.65	0.85
2.50	1.61	0.89

- 2 (d) (i) Draw a ring around the **average** mass lost for these two sets of results.

0.85 g 0.87 g 0.89 g

(1 mark)

- 2 (d) (ii) The student used the same mass of copper sulfate each time but the mass lost was different.

Put a tick (✓) next to the **two** reasons which could explain why the mass lost is different.

Reason	(✓)
The student used different test tubes for the two experiments.	
The student made errors in weighing during the experiments.	
The student used more ice in one of the experiments.	
The student did not heat the copper sulfate for long enough in one of the experiments.	

(2 marks)

- 2 (e) Anhydrous copper sulfate is used to test for water.

Use words from the box to complete the sentence.

blue	green	red	white
-------------	--------------	------------	--------------

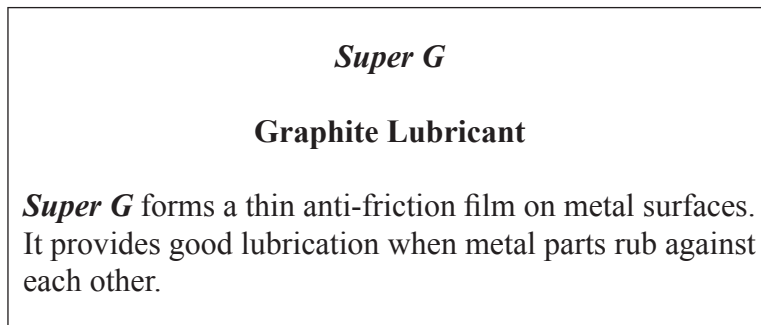
Water changes the colour of anhydrous copper sulfate from

to

(2 marks)



- 3 This label was on a container of graphite lubricant.



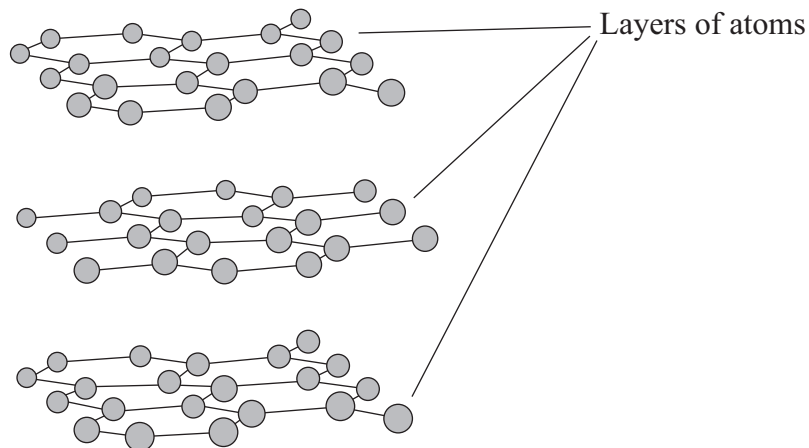
- 3 (a) Give **one** reason why a lubricant is used when metal parts rub against each other.

.....

.....

(1 mark)

- 3 (b) The diagram shows the arrangement of atoms in graphite.



- 3 (b) (i) Draw a ring around the type of atoms in graphite.

aluminium

carbon

silicon

(1 mark)



- 3 (b) (ii) Graphite is a good lubricant because it is slippery. Use the diagram to explain why graphite is slippery.

.....

.....

.....

.....

.....

(2 marks)

4

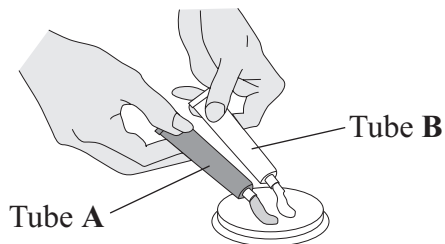
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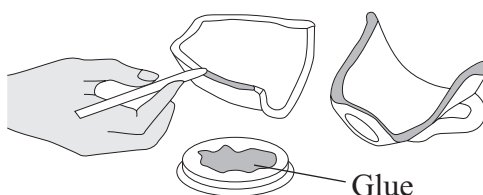


4 The following steps show how to use a type of glue.

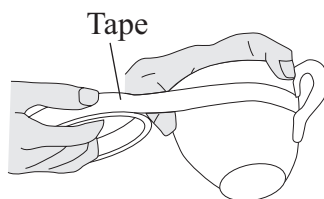
Step 1 Measure out equal amounts of the liquids from tubes **A** and **B**.



Step 2 Mix the liquids to make the glue.
Put a thin layer of the glue onto each of the surfaces to be joined.



Step 3 Assemble the pieces to be joined and then hold them together with tape.



Step 4 Leave the glue to set.

4 (a) When liquids **A** and **B** are mixed a chemical reaction takes place.

4 (a) (i) This reaction is exothermic.

Complete the sentence below using a word or phrase from the box.

decrease	increase	stay the same
----------	----------	---------------

During the reaction the temperature of the mixture will
(1 mark)



- 4 (a) (ii) When the glue sets it forms a giant covalent structure.

Draw a ring around **one** property that you would expect the set glue to have.

good conductor of electricity **low melting point** **high melting point**

(1 mark)

- 4 (b) The time taken for the glue to set at different temperatures is given in the table below.

Temperature in °C	Time taken for the glue to set
20	3 days
60	6 hours
90	1 hour

- 4 (b) (i) Complete the sentences below using words or phrases from the box.

decreases **increases** **stays the same**

When the temperature is increased the time taken for the glue to set

.....

When the temperature is increased the rate of the setting reaction

.....

(2 marks)

- 4 (b) (ii) Put a tick (✓) next to the **two** reasons why an increase in temperature affects the rate of reaction.

Reason	(✓)
It gives the particles more energy.	
It increases the concentration of the particles.	
It increases the surface area of the particles.	
It makes the particles move faster.	

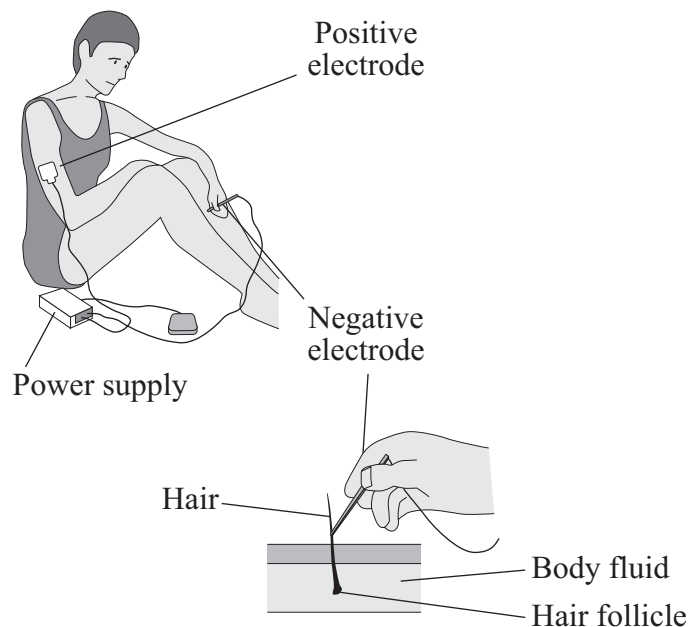
(2 marks)

6

Turn over ►



- 5 Electrolysis can be used to remove unwanted hair from the skin.



The positive electrode is connected by a patch to the skin.

The negative electrode is connected to the hair.

The body fluid is a solution that contains sodium chloride. The electricity causes the electrolysis of a small amount of this solution.

- 5 (a) In this solution hydrogen ions move to the negative electrode.

Complete the sentence using **one** word from the box.

negative	neutral	positive
-----------------	----------------	-----------------

Hydrogen ions move to the negative electrode because they have a
..... charge.

(1 mark)

- 5 (b) Draw a ring around the name of the gas produced at the positive electrode during the electrolysis of sodium chloride solution.

chlorine hydrogen nitrogen

(1 mark)



5 (c) The electrolysis of the sodium chloride solution forms a strong alkali around the hair follicle.

5 (c) (i) Complete the name of this strong alkali using **one** of the words from the box.

chloride	hydroxide	nitrate
----------	-----------	---------

The name of this strong alkali is sodium
(1 mark)

5 (c) (ii) Suggest how this strong alkali helps to remove the hair.

.....
.....
(1 mark)

4

Turn over for the next question

Turn over ►



6 Read the article and then answer the questions that follow.

Nanotennis!

Tennis balls contain air under pressure, which gives them their bounce. Normal tennis balls are changed at regular intervals during tennis matches because they slowly lose some of the air. This means that a large number of balls are needed for a tennis tournament, using up a lot of materials.



'Nanocoated' tennis balls have a 'nanosize' layer of butyl rubber. This layer slows down the escape of air so that the ball does not lose its pressure as quickly. The 'nanocoated' tennis balls last much longer and do not need to be replaced as often.

6 (a) How does the 'nanosize' layer make the tennis balls last longer?

.....
.....

(1 mark)



- 6 (b) Put a tick (✓) next to the best description of a 'nanosize' layer.

Description	(✓)
A layer one atom thick.	
A layer a few hundred atoms thick.	
A layer millions of atoms thick.	

(1 mark)

- 6 (c) Suggest why using 'nanocoated' tennis balls would be good for the environment.

.....

.....

.....

.....

.....

(2 marks)

4

Turn over for the next question

Turn over ►



- 7 Iron is an essential part of the human diet. Iron(II) sulfate is sometimes added to white bread flour to provide some of the iron in a person's diet.



- 7 (a) The formula of iron(II) sulfate is FeSO_4

Calculate the relative formula mass (M_r) of FeSO_4

Relative atomic masses: O = 16; S = 32; Fe = 56.

.....

The relative formula mass (M_r) = (2 marks)

- 7 (b) What is the mass of one mole of iron(II) sulfate? Remember to give the unit.

.....
 (1 mark)

- 7 (c) What mass of iron(II) sulfate would be needed to provide 28 grams of iron?
 Remember to give the unit.

.....
 (1 mark)

4

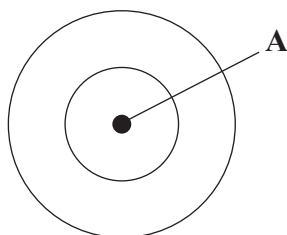


8 This question is about oxygen atoms. The periodic table on the Data Sheet may help you to answer this question.

8 (a) (i) Oxygen atoms have 8 electrons.

Complete the diagram to represent the arrangement of electrons in an oxygen atom.

Use crosses (×) to represent the electrons.

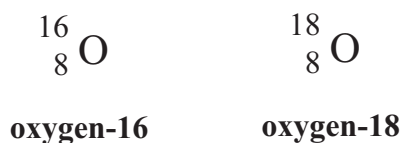


(1 mark)

8 (a) (ii) Name the part of the oxygen atom that is labelled **A** on the diagram.

.....
(1 mark)

8 (b) Two isotopes of oxygen are oxygen-16 and oxygen-18.



Explain, in terms of particles, how the nucleus of an oxygen-18 atom is different from the nucleus of an oxygen-16 atom.

.....
.....
.....
.....

(2 marks)

4

Turn over ►



9 Read the information below and then answer the questions that follow.

It was once thought that organic compounds could be made only in living organisms. The living organisms were assumed to have a special life force. This life force allowed them to make organic compounds.

Urea is an organic compound produced in animals. It is found in urine. In 1828, Friedrich Wöhler made urea from chemicals which were not obtained from living things.



Other famous scientists still believed in the idea of a life force. Wöhler made another organic compound in 1845. Most scientists then stopped believing that a life force was needed to make organic compounds.

9 (a) How did Wöhler prove that a life force is **not** needed to make organic compounds?

.....
.....

(1 mark)

9 (b) Suggest why in 1828 most scientists continued to believe that a life force was needed to produce an organic compound.

.....
.....

(1 mark)



- 9 (c) Suggest why in 1845 most scientists stopped believing that a life force was needed to make an organic compound.

.....

(1 mark)

- 9 (d) Some scientists repeated Wöhler's experiment.

These scientists used lead nitrate as one of their starting materials.

Lead nitrate solution can be made by reacting lead with an acid.

- 9 (d) (i) Give the name of this acid.
 (1 mark)

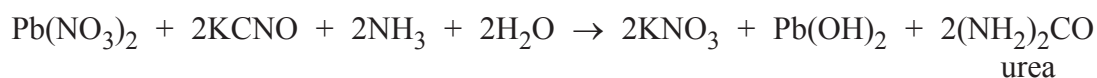
- 9 (d) (ii) State how solid lead nitrate can be obtained from lead nitrate solution.

.....

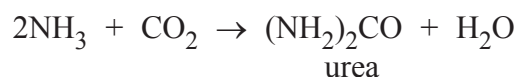
(1 mark)

- 9 (e) The equations below show two methods of making urea.

Method 1 (Wöhler's method)



Method 2 (The modern industrial method)



Method 2 has a higher atom economy than method 1.

Use information from the equations to explain why.

.....

(2 marks)

END OF QUESTIONS

7



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