

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
June 2007

SCIENCE B
Unit Chemistry C1

CHEMISTRY
Unit Chemistry C1

Higher Tier

Thursday 21 June 2007 1.30 pm to 2.15 pm

<p>For this paper you must have:</p> <ul style="list-style-type: none"> a ruler. <p>You may use a calculator.</p>

Time allowed: 45 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- 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.

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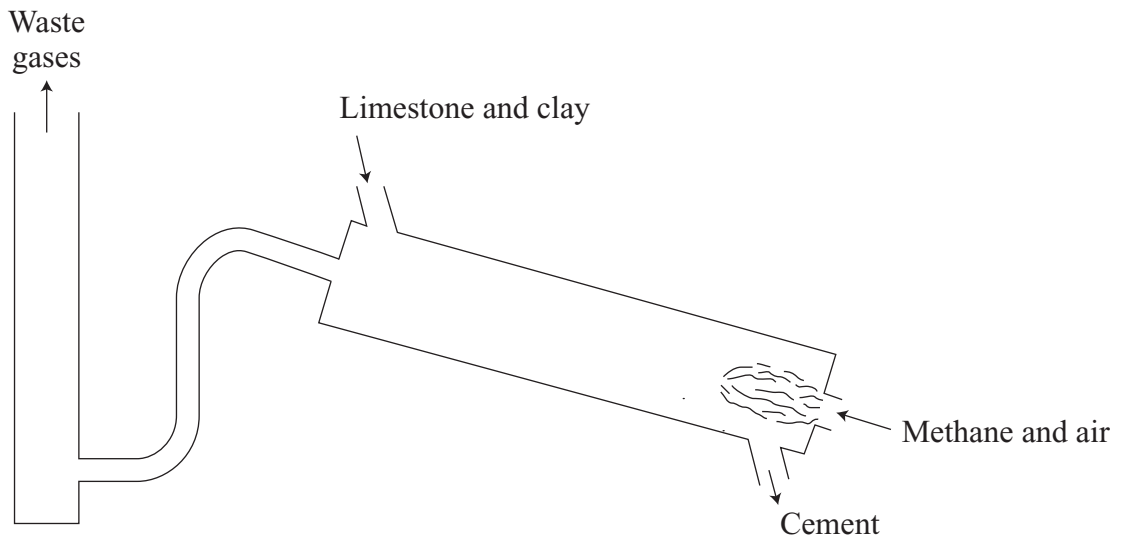


For Examiner's Use			
Question	Mark	Question	Mark
1		3	
2		4	
		5	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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

1 Limestone contains the compound calcium carbonate, CaCO_3 .

(a) Limestone is used to make cement in a rotary kiln.



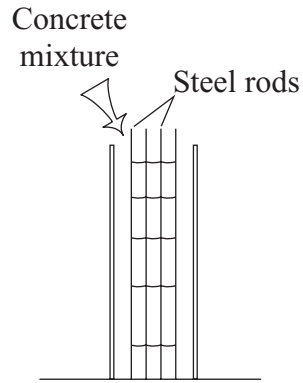
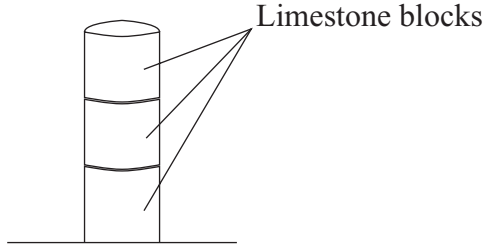
Use the information in the diagram to name the **two** main waste gases from this rotary kiln.

1

2

(2 marks)

(b) Columns used as supports for buildings can be made from materials such as limestone blocks or concrete.



Concrete is a mixture of cement, sand, small stones and water

From the diagrams, name which you think is the better material for making a column.

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Give **three** advantages for your choice of material.

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2

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(3 marks)

5

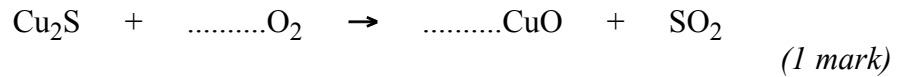
Turn over for the next question

Turn over ▶

2 Copper is a widely used metal. The main ore of copper contains copper sulfide. Copper can be extracted from copper sulfide in a three stage process.

(a) In the first stage of extraction the copper sulfide is heated in air.

(i) Balance the symbol equation for the reaction.



(ii) Explain why there would be an environmental problem if the gas from this reaction were allowed to escape into the atmosphere.

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(2 marks)

(b) In the second stage copper oxide, CuO, is reduced using carbon.

Describe and explain what happens during this reaction.

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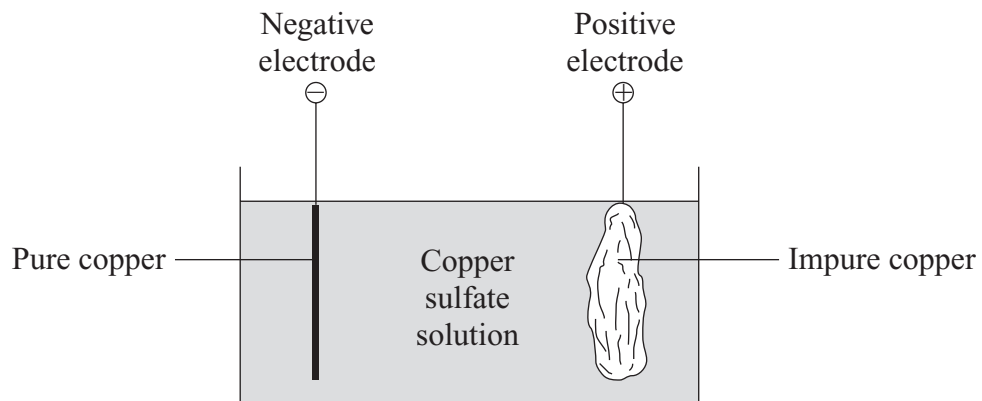
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(2 marks)

(c) During the third stage the copper can be purified as shown in the diagram.



(i) What is the name of the type of process used for this purification?

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(1 mark)

(ii) Give **one** use of purified copper.

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(1 mark)

(d) Copper-rich ores are running out.

New ways of extracting copper from low grade ores are being researched.

Recycling of copper may be better than extracting copper from its ores.

Explain why.

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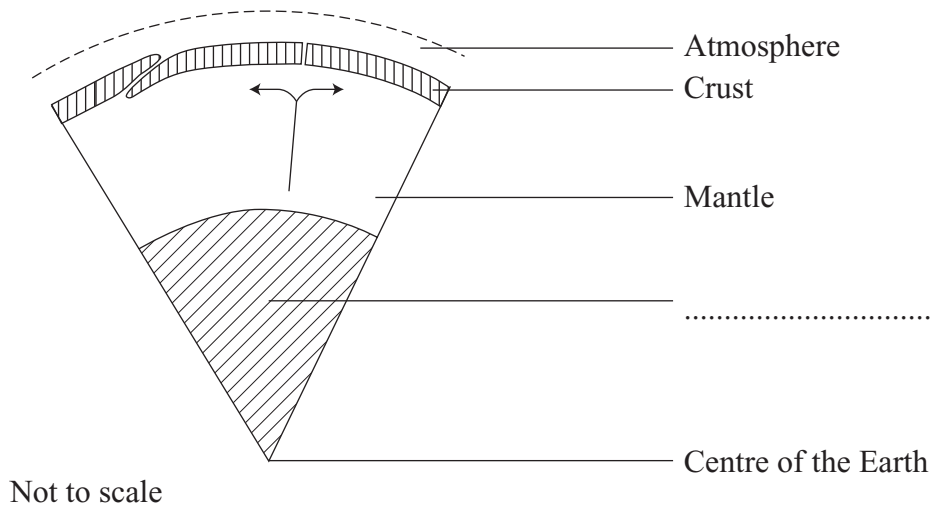
(3 marks)

10

Turn over ►

3 The Earth is shaped like a sphere and is surrounded by an atmosphere.

(a) The diagram shows a section of the layered structure of the Earth.



(i) Complete the diagram by writing in the missing label. (1 mark)

(ii) Earthquakes within the Earth's crust can be sudden and disastrous. Scientists cannot accurately predict when earthquakes will occur.

Explain why.

To obtain full marks you must support your answer with a description of what causes earthquakes.

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(4 marks)

- (b) Some theories suggest that the Earth's early atmosphere was like the atmosphere of Mars today.

Gases	The atmosphere of Mars today	The atmosphere of Earth today
Carbon dioxide %	95	0.03
Nitrogen %	3	
Argon %	1.5	0.97
Oxygen %	0.5	21

- (i) Complete the table by writing in the percentage of nitrogen in the atmosphere of Earth today. *(1 mark)*
- (ii) Use the information in the table to describe the changes that have happened to **two** of the gases in the Earth's atmosphere.

Explain what has caused these changes.

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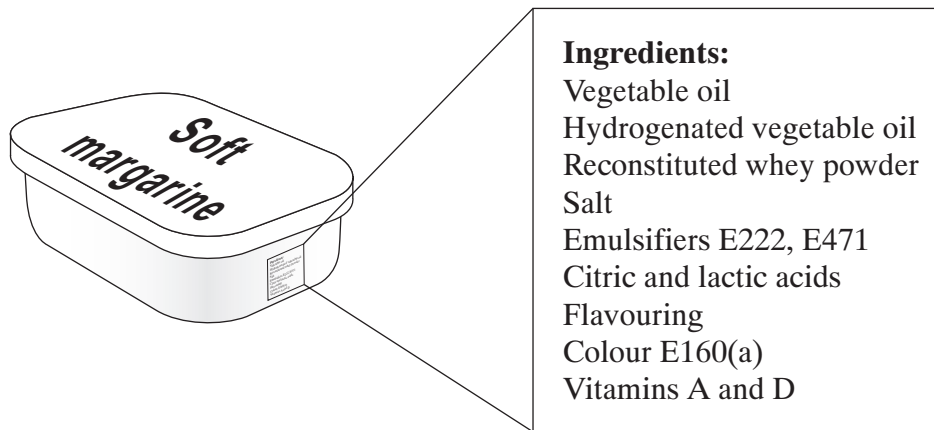
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(4 marks)

4 Processed food may contain additives. These additives are listed in the ingredients.

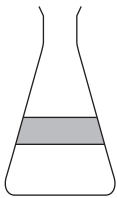
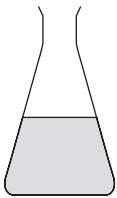


(a) What do the E-numbers indicate?

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 (1 mark)

(b) The diagrams show the results of shaking a vegetable oil with the substances indicated.

Vegetable oil and water	Vegetable oil, water and an additive
 <p style="text-align: center;">Flask 1</p>	 <p style="text-align: center;">Flask 2</p>

(i) Give a reason for the result in **Flask 1**.

.....

 (1 mark)

(ii) Explain the result in **Flask 2**.

.....

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.....

(2 marks)

(c) Saturated fats are linked to heart problems. Oils that are unsaturated help to prevent heart disease. A company wants to make a 'healthy' soft margarine.

The company tested the same volume of different vegetable oils by shaking each with three drops of iodine solution. The results are shown in the table.

Vegetable oil	Time in minutes for the colour of iodine to 'disappear'
Olive oil	3.5
Peanut oil	3.0
Soya oil	1.5
Sunflower oil	1.0

(i) Why does iodine react with the molecules in these oils?

.....

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(1 mark)

(ii) Use the company results to evaluate which one appears to be the most 'healthy' vegetable oil to use in the soft margarine.

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(2 marks)

Question 4 continues on the next page

Turn over ►

(d) The ingredients of soft margarine include hydrogenated vegetable oil.

(i) Why is hydrogenated vegetable oil used in soft margarine?

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(1 mark)

(ii) Describe how vegetable oils are hydrogenated.

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(2 marks)

10

5 Known crude oil reserves are being used up rapidly. Crude oil is used to produce many useful fuels, such as petrol. One way to conserve crude oil reserves would be to increase the production of bio-fuels.

(a) Ethanol can be produced for use as a bio-fuel. Cars can be powered by ethanol or ethanol–petrol mixtures.

Sugar cane can be fermented to give a mixture of water (boiling point 100 °C) and ethanol (boiling point 78 °C).

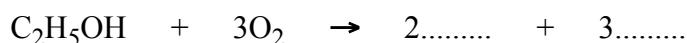
(i) How can ethanol be separated from water?

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(1 mark)

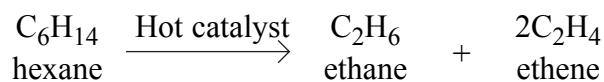
(ii) Ethanol, C₂H₅OH, burns to release heat energy.

Complete the balanced symbol equation by writing in the formulae of the two products.



(2 marks)

- (b) The cost of producing a bio-fuel, such as ethanol, by fermentation, is at least three times higher than the production cost of petrol. It costs less to produce ethanol from alkanes. In the production, the vapour of an alkane is passed over a hot catalyst.



Ethene is then converted into ethanol.

- (i) What has happened to the hexane to produce ethene?

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(1 mark)

- (ii) Complete the structural formula for ethene, C₂H₄.

C C

(1 mark)

- (iii) Name the compound that is added to ethene to produce ethanol, C₂H₅OH.

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(1 mark)

- (c) As explained in parts (a) and (b), ethanol can be made using either sugar or alkanes as the starting material.

Evaluate the advantages and disadvantages of using these two starting materials to produce ethanol.

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(4 marks)

END OF QUESTIONS

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