

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2004



**SCIENCE SINGLE AWARD (CO-ORDINATED) 3463/2H
HIGHER TIER
PAPER 2**

Monday 14 June 2004 9.00 am to 9.45 am

H

In addition to this paper you will require:

- a ruler;
- the Data Sheet (enclosed).

You may use a calculator.

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

Time allowed: 45 minutes

Instructions

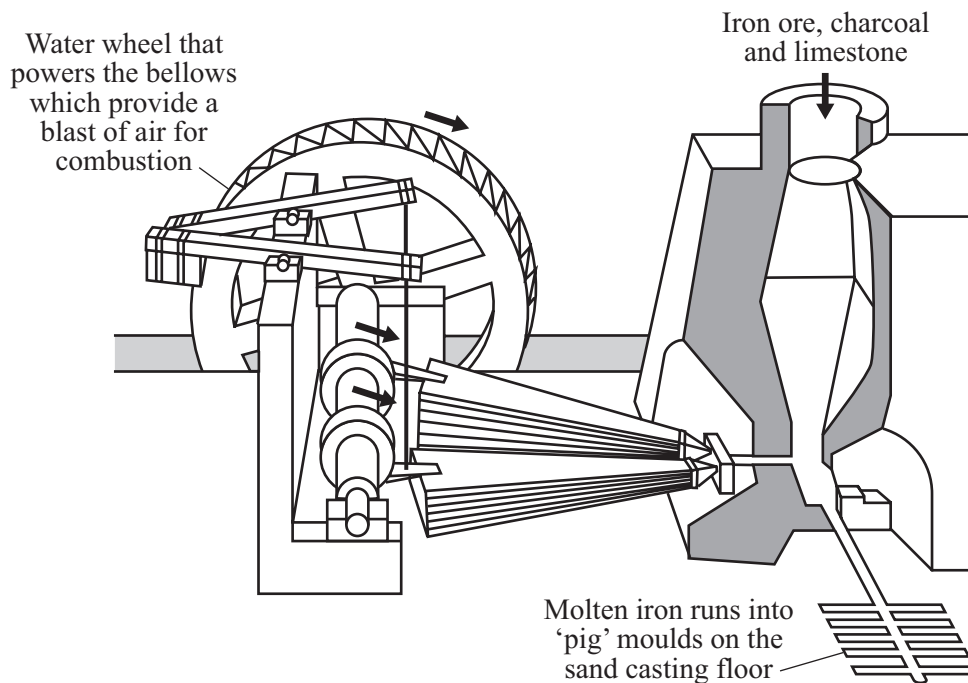
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

- The maximum mark for this paper is 45.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

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

- 1 The diagram shows an early type of blast furnace used in Wales about 300 years ago.



- (a) (i) This early type of furnace uses charcoal. Name the raw material that has replaced charcoal in modern furnaces.

.....
(1 mark)

- (ii) State **one** other way in which this early type of furnace differs from a modern furnace.

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

- (b) The charcoal provides carbon. This reacts with oxygen to form carbon monoxide. The iron oxide in the iron ore is *reduced* by the carbon monoxide.

- (i) State what the word *reduced* means.

.....
(1 mark)

- (ii) Name the **two** substances formed when iron oxide reacts with carbon monoxide.

..... and
(1 mark)

(c) Why is limestone added to the blast furnace?

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.....

(1 mark)

(d) Explain why sodium cannot be extracted from its ore by this method.

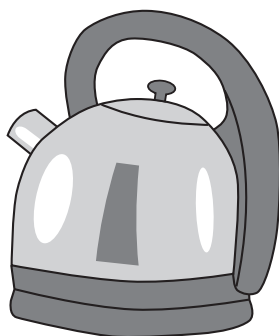
The Data Sheet may help you to answer this question.

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(2 marks)

(e) Stainless steel is an alloy which contains iron and other metals.

This kettle is made from stainless steel.



(i) Name a metal which is added to iron to make stainless steel.

.....

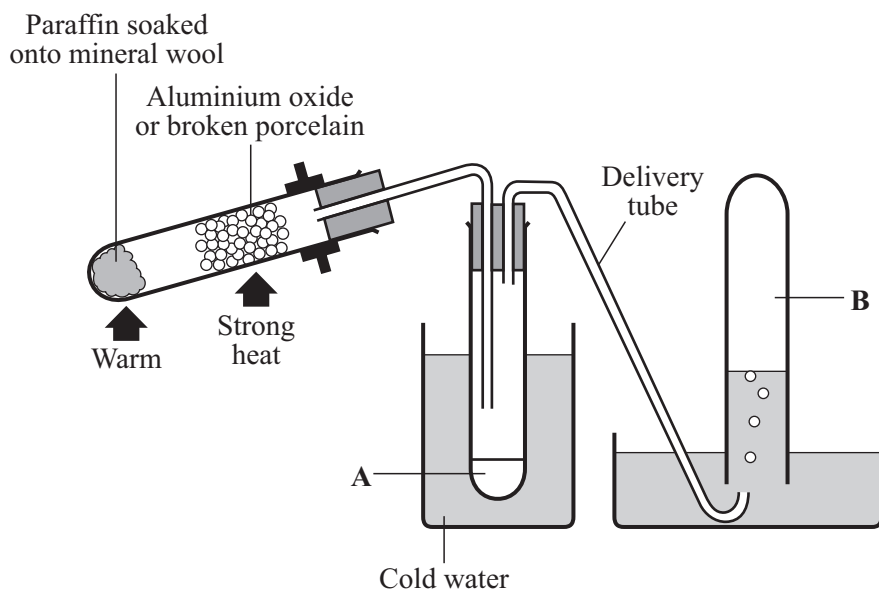
(1 mark)

(ii) Why is stainless steel a good material for making kettles?

.....
.....

(1 mark)

2 The diagram shows an apparatus that can be used to carry out cracking reactions in a laboratory.

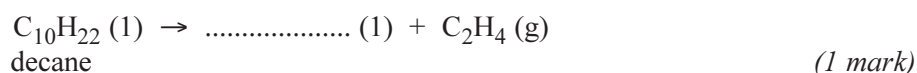


(a) Why is aluminium oxide or broken porcelain used?

.....
(1 mark)

(b) Paraffin contains decane. The cracking of decane can be represented by the equation below. A decane molecule is split into two smaller molecules.

Complete the equation by adding the formula of the other product.



(c) Would you expect C_2H_4 molecules to collect at position **A** or **B** shown on the diagram?

Position.....

Explain your answer.

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

(d) Cracking reactions involve *thermal decomposition*.

What is meant by *thermal decomposition*?

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(2 marks)

(e) Explain, as fully as you can, why cracking is used in the oil industry.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(3 marks)

(f) The cracking reaction produces a mixture of products. The mixture contains hydrocarbons with different boiling points.

Suggest a method of separating this mixture.

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(1 mark)

9

Turn over ►

3 The periodic table on the Data Sheet may help you to answer this question.

- (a) Newlands and Mendeleev both designed periodic tables in which the elements were put in the order of their relative atomic masses.

When the elements are put in this order a few of them are placed incorrectly when compared with a modern periodic table.

- (i) Give **one** example of a pair of elements that would be placed incorrectly if they were in the order of their relative atomic masses.

..... and

(1 mark)

- (ii) Explain why placing these two elements in the order of their relative atomic masses would **not** be correct.

.....

.....

(1 mark)

- (b) In the modern periodic table the elements are put in order of their atomic (proton) numbers.

Explain how the positions of the elements in the periodic table are linked to the electronic structure of their atoms.

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(2 marks)



4 Caesium is an element in Group 1 of the periodic table.

- (a) Which of the electronic structures represented by **A** to **D** is correct for a caesium atom?

The periodic table on the Data Sheet may help you to answer this question.

	Electronic structure
A	2, 8, 18, 18, 8, 1
B	2, 8, 18, 18, 9
C	2, 8, 18, 27
D	2, 8, 18, 18, 6, 3

The electronic structure for a caesium atom is represented by letter
(1 mark)

- (b) When a small piece of lithium is added to cold water it fizzes around on the surface of the water. A small piece of caesium explodes when added to water.

Explain in terms of electronic structure why a caesium atom is more reactive than a lithium atom.

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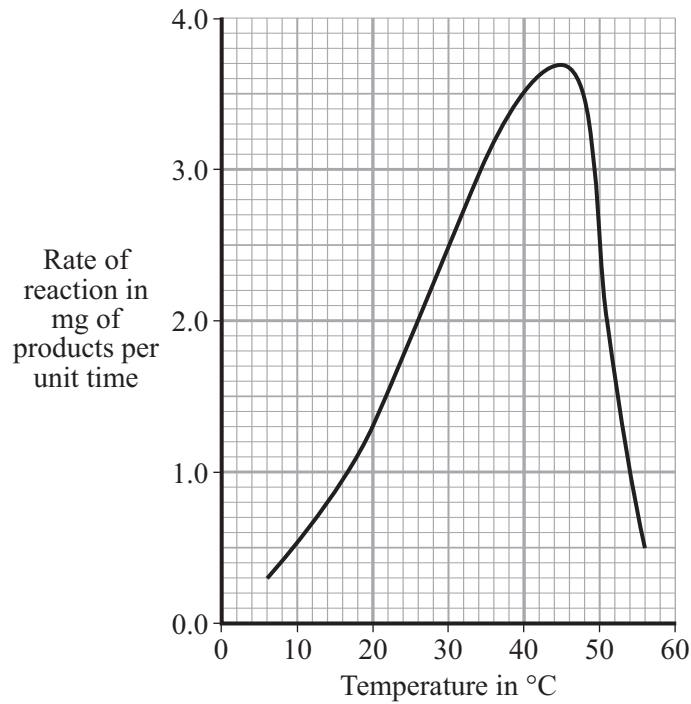
(2 marks)

3

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 5 (a) The graph shows how the rate of an enzyme-catalysed reaction changes with temperature.



- (i) Explain why, in terms of particles, the rate of most reactions increases as the temperature is increased.

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(3 marks)

- (ii) Suggest a disadvantage of using an enzyme to speed up this reaction.

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(1 mark)

- (b) Read the passage below about one use of enzymes in industry.

Preparation of acrylamide

Acrylamide is an important chemical used in the manufacture of polymers. It is produced by the addition of water to acrylonitrile.



The reaction can be catalysed using Cu^+ ions but the yield of acrylamide is low and a mixture of products is obtained at the relatively high temperature needed (between 80°C and 140°C).

These problems can be overcome by using an immobilised enzyme. The stability of the enzyme is increased by making it immobilised.

This enzyme-catalysed reaction takes place at 10°C and produces a high yield of acrylamide and virtually no other products.

About 4000 tonnes of acrylamide are produced each year using this method.

- (i) Give **three** advantages of using an enzyme catalyst for this reaction.

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(3 marks)

- (ii) Why is it important that the enzyme is stabilised?

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(1 mark)

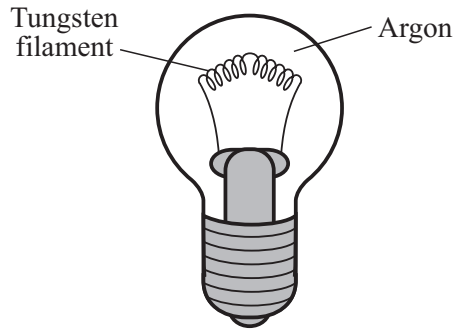
- (iii) Describe how the enzyme could be immobilised.

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.....
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(2 marks)

Turn over ►

6 The diagram shows an electric light bulb.



When electricity is passed through the tungsten filament it gets very hot and gives out light.

(a) What reaction would take place if the hot tungsten was surrounded by air?

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(1 mark)

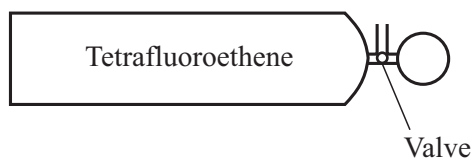
(b) State why argon is used in the light bulb. Explain your answer in terms of the electronic structure of an argon atom.

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(3 marks)

4

- 7 In 1939 Roy Plunkett opened the valve on a new cylinder of tetrafluoroethene gas. No gas came out!

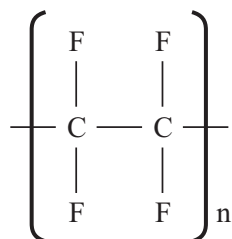


He cut the cylinder open and found that the gas had changed into a white solid. This solid was an addition polymer.

- (a) Give the name of the addition polymer that formed inside the cylinder.

.....
(1 mark)

- (b) The structure of this polymer can be represented by the diagram below.



Draw the structure of the monomer, tetrafluoroethene, from which it is formed.

(2 marks)

- (c) Describe how this addition polymer forms from monomers.

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(3 marks)

END OF QUESTIONS

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE