

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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



General Certificate of Secondary Education
Higher Tier
June 2011

Science B
Unit Chemistry C1

CHY1H

H

Chemistry
Unit Chemistry C1

Wednesday 15 June 2011 9.00 am to 9.45 am

For this paper you must have:

- a ruler.
- 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.



J U N 1 1 C H Y 1 H O 1

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

1 Scientists state that unsaturated fats are healthier to eat than saturated fats.

The table shows some information about four fats.

Fat	Fat content as a percentage (%)		Melting point in °C
	Unsaturated	Saturated	
A	80	20	-11
B	60	40	-5
C	30	70	+4
D	10	90	+63

1 (a) (i) Which fat, **A**, **B**, **C** or **D**, has the lowest melting point?

(1 mark)

1 (a) (ii) Use the information in the table to describe the pattern between the percentage of unsaturated fat and the melting point.

.....
.....

(1 mark)

1 (a) (iii) Which fat, **A**, **B**, **C** or **D**, contains the smallest number of carbon carbon double bonds per gram?

(1 mark)

1 (b) Fat **A** is reacted with hydrogen (hydrogenated).

State **one** way in which the physical properties of Fat **A** are changed by this reaction.

.....
.....

(1 mark)



1 (c) Tick (✓) **one** thing that scientists are **not** able to do.

One thing that scientists are not able to do	Tick (✓)
find out if a fat is unsaturated	
show that an unsaturated fat is healthier to eat than a saturated fat	
stop people eating unhealthy fat	
change unsaturated fat to saturated fat	

(1 mark)

5

Turn over for the next question

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2 The raw materials used to make the polymer polyvinyl chloride (PVC) are crude oil and sea salt (sodium chloride).

2 (a) There are three main stages in the production of PVC.

2 (a) (i) **Stage 1** Cracking of hydrocarbons from crude oil produces ethene, C_2H_4



How are hydrocarbons cracked?

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(2 marks)

2 (a) (ii) **Stage 2** Electrolysis of sodium chloride solution produces chlorine.

Ethene from **Stage 1** is then reacted with this chlorine.

One of the hydrogen atoms in each ethene molecule is replaced by a chlorine atom to produce vinyl chloride.

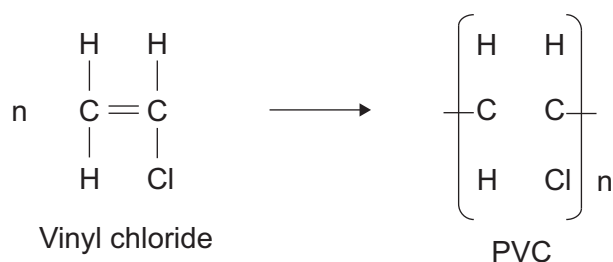
Complete the chemical equation by writing in the formula of the product vinyl chloride.



(1 mark)

2 (a) (iii) **Stage 3** Polymerisation of vinyl chloride produces polyvinyl chloride (PVC).

Complete the chemical equation by drawing in the missing bonds of the product, PVC.



(1 mark)

Question 2 continues on the next page

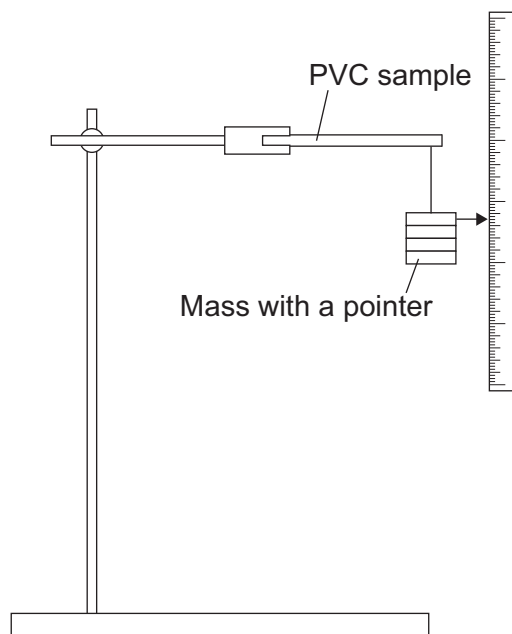
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- 2 (b)** Unplasticised polyvinyl chloride (uPVC) is used to make door and window frames. PVC with a plasticiser added is used to make cling film for wrapping food. A plasticiser is a chemical compound.

A student investigated how the percentage of plasticiser added to PVC affected its flexibility.

The student measured the bending of PVC samples when a mass was added.



The student's results are shown in the table.

Sample of PVC	Percentage (%) of plasticiser added	Bending of PVC sample in mm				
		Test 1	Test 2	Test 3	Test 4	Mean
A	0	2	3	3	4	3
B	5	22	15	23	24	
C	10	27	27	29	29	28
D	15	34	35	35	36	35

- 2 (b) (i)** Each PVC sample should be the same size to make it a fair test. Explain why.

.....

(1 mark)



2 (b) (ii) The student repeated the test four times for each sample.
Explain why.

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.....

(1 mark)

2 (b) (iii) Calculate the mean value for sample B.

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(2 marks)

2 (b) (iv) Each of the samples bent the most in test 4.
Suggest a possible reason for this.

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(1 mark)

2 (c) Suggest why unplasticised polyvinyl chloride (uPVC) is used to make door and window frames.

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(1 mark)

10

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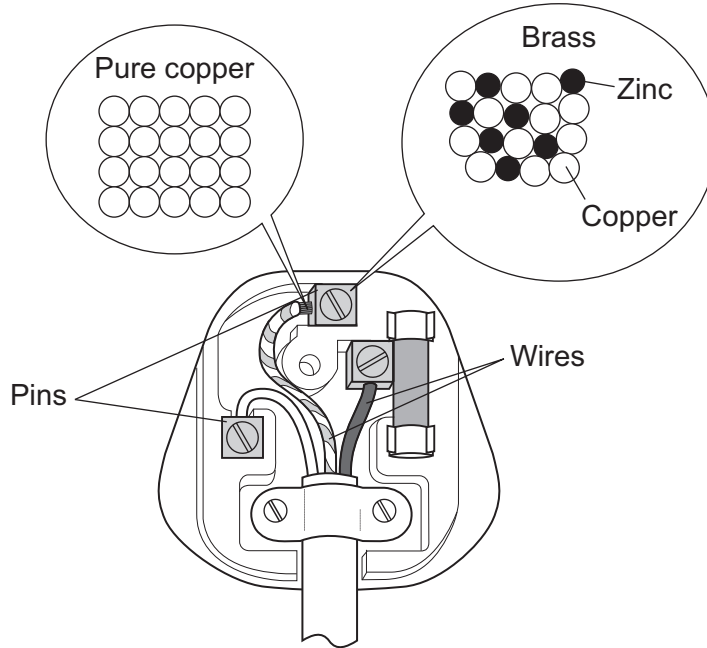


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3 The diagram shows an electric plug.



3 (a) Brass is used for the pins because it is harder than pure copper. Use the particle diagrams to help you to explain why.

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(2 marks)

Question 3 continues on the next page

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3 (b) An ore contains a mixture of zinc carbonate and lead carbonate. Zinc and lead are produced from this ore by two reactions.

3 (b) (i) Reaction 1: The carbonates in the ore are converted into a mixture of zinc oxide and lead oxide.

Name this type of reaction.

How is this reaction done?

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(2 marks)

3 (b) (ii) Reaction 2: The metal oxides are mixed with carbon and heated in a furnace to produce zinc and lead.

Explain why zinc and lead are produced.

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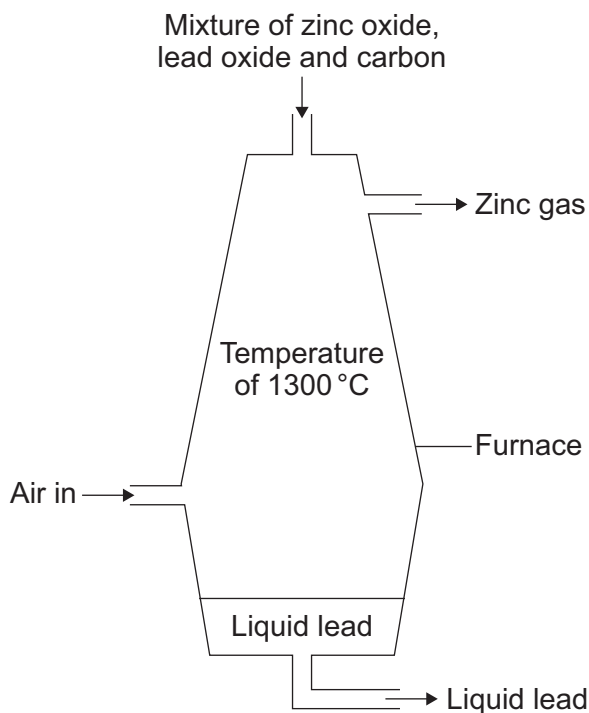
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(2 marks)



3 (b) (iii) The diagram represents a furnace used to produce zinc and lead from their oxides.



Metal	Melting point in °C	Boiling point in °C	Density in g per cm ³
Lead	328	1751	11.3
Zinc	420	908	7.1

Use the diagram and the information in the table to explain how zinc and lead are separated in the furnace.

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(2 marks)

8

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4 (c) A manufacturer used an independent scientist to show that their orange drink did not contain these three additives.

4 (c) (i) Suggest why the manufacturer would use a scientist who was independent instead of using their own scientist.

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.....

(1 mark)

4 (c) (ii) The scientist had samples of E102, E104 and E110 and the orange drink. The scientist used paper chromatography for the test.

Describe how the scientist could use the results to show that the orange drink did not contain any of these three additives. (You may include a diagram of the paper chromatography results.)

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(2 marks)

9

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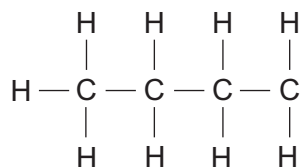
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5 Crude oil is a mixture of hydrocarbons. Most of these hydrocarbons are alkanes.

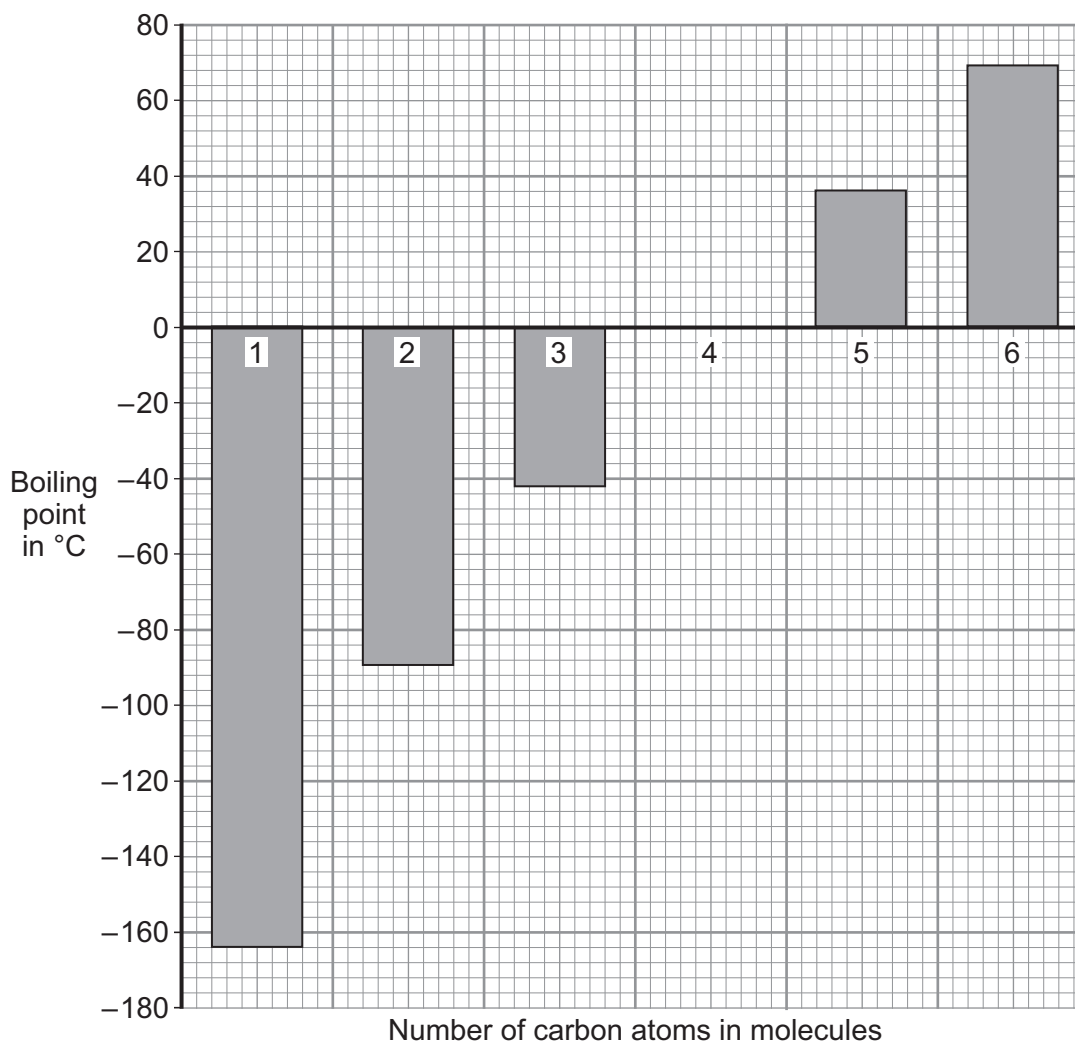
5 (a) The general formula of an alkane is C_nH_{2n+2}

Complete the structural formula for the alkane that has **six** carbon atoms in its molecules.



(1 mark)

5 (b) The boiling points of alkanes are linked to the number of carbon atoms in their molecules.



5 (b) (i) Describe the link between the number of carbon atoms in an alkane molecule and its boiling point.

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(1 mark)



5 (b) (ii) Suggest **two** reasons why all of the alkanes in the bar chart are better fuels than the alkane with the formula $C_{30}H_{62}$

1

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(2 marks)

5 (c) During the last 200 million years the carbon cycle has maintained the percentage of carbon dioxide in the atmosphere at about 0.03%.

Over the last 100 years the percentage of carbon dioxide in the atmosphere has increased to about 0.04%.

Most of this increase is caused by burning fossil fuels to heat buildings, to generate electricity and to power our transport.

Fossil fuels contain carbon that has been locked up for millions of years.

5 (c) (i) Burning fossil fuels, such as petrol, releases this locked up carbon. Balance the chemical equation for the combustion of one of the alkanes in petrol.



(1 mark)

5 (c) (ii) Where did the carbon that is locked up in fossil fuels come from?

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(1 mark)

5 (c) (iii) The burning of fossil fuels has caused the percentage of carbon dioxide in the atmosphere to increase to above 0.03%.

Explain why.

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(2 marks)

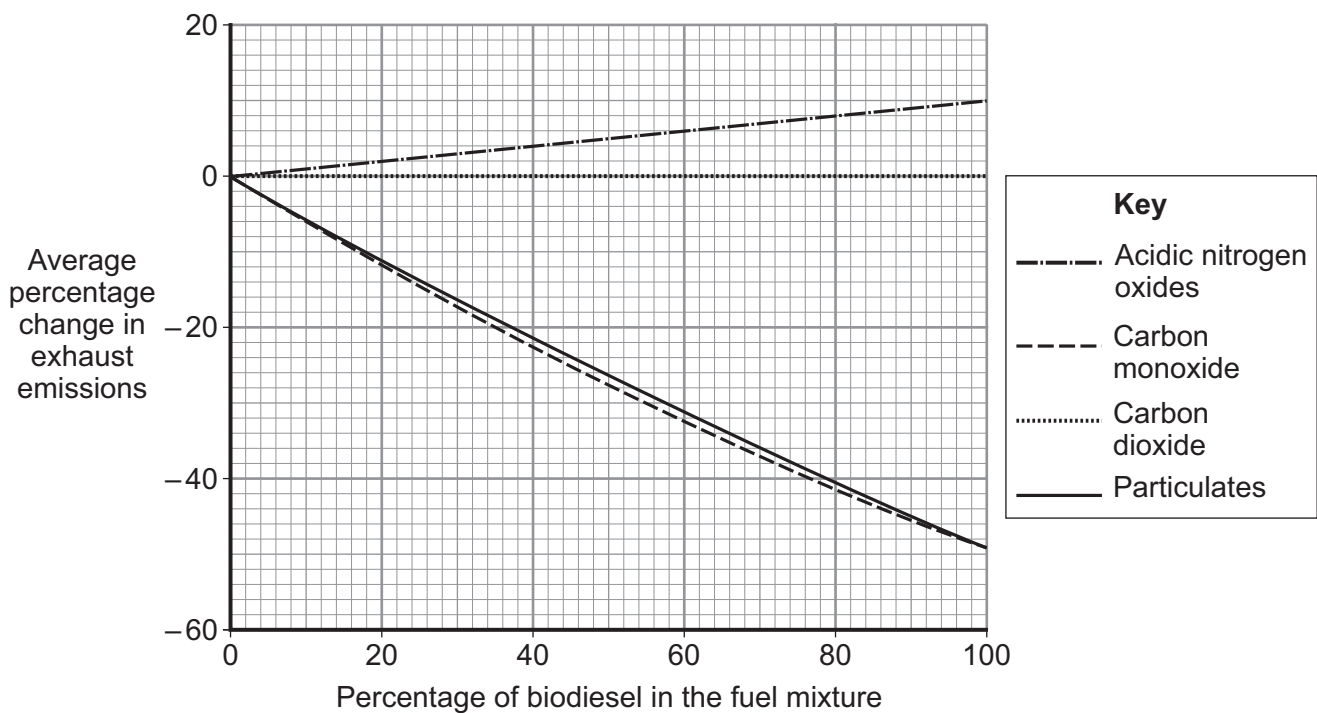


6 Petroleum diesel is produced from crude oil.

Most vehicles that use petroleum diesel as fuel can also use biodiesel or a mixture of these two fuels. In the UK (in 2010) there must be 5% biodiesel in all petroleum diesel fuel.

Biodiesel is produced from plant oils such as soya. The crops used to produce biodiesel can also be used to feed humans. The benefit that biodiesel is 'carbon neutral' is outweighed by the increasing demand for crops. This increasing demand is causing forests to be burnt to provide land for crops to produce biodiesel. Only a huge fall in the price of petroleum diesel would halt the increasing use of biodiesel.

The graph shows the average percentage change in exhaust emissions from vehicles using different mixtures of petroleum diesel and biodiesel.



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